1 JULY 1954

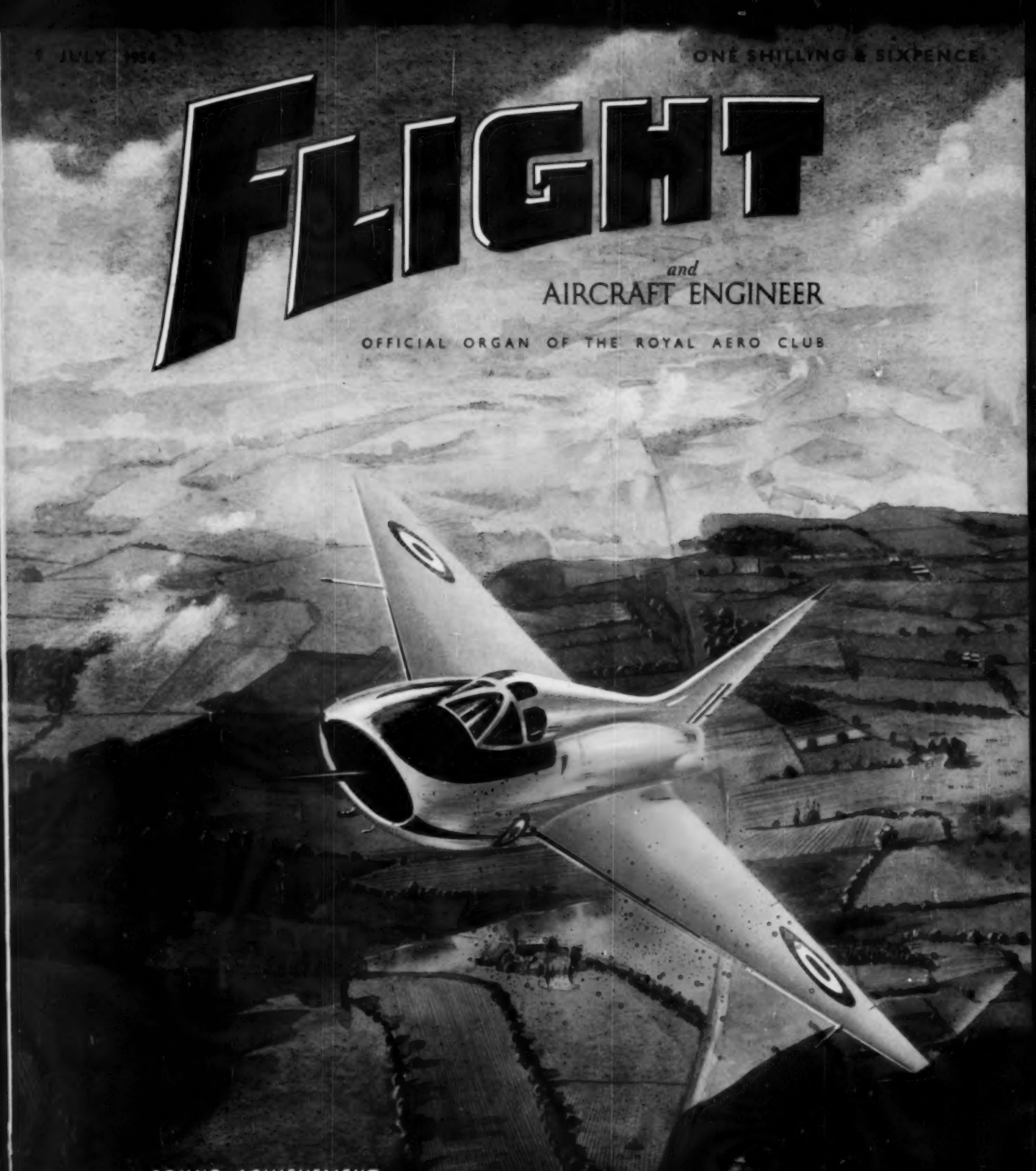
ONE SHILLING & SIXPENCE

FLIGHT

and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB



SOUND ACHIEVEMENT

BPA

BOULTON PAUL AIRCRAFT LTD

WOLVERHAMPTON · ENGLAND

The photograph shows the PERCIVAL "PROVOST" T. Mk. 1, fully aerobatic Standard Basic Trainer in service with the R.A.F.

The versatile and well proved range of **PERCIVAL** aircraft powered by Alvis "Leonides" engines

ARE FITTED WITH

Hobson

MASTER CONTROL

INJECTION CARBURETTERS

Aircraft manufacturers in Great Britain and many other countries specify Hobson equipment, safe in the knowledge that their own reputations for the production of reliable high performance machines are matched by the established reputation of H. M. Hobson, Ltd., for the supply of important aircraft components of proved and unsurpassed worth.

H. M. HOBSON LIMITED

FORDHOUSES · WOLVERHAMPTON

Specialists in the design and manufacture of POWER FLYING CONTROLS · GAS TURBINE ENGINE ACCESSORIES · CARBURETTERS · INJECTORS · ETC.

Licensees in U.S.A. and Canada: Simmonds Aerocessories Inc., Tarrytown, NEW YORK, U.S.A.
Licensees in Italy: Seconda Mona, SOMMA LOMBARDO.
Agents in France: Societe Commerciale et Industrielle Franco-Britannique, 48 Avenue Raymond Poincare, PARIS XVI.
Agents in Australia: Aeronautical Supply Co. Pty. Ltd., 210 Victoria Street, MELBOURNE, Victoria.
Agents in Spain: Senor Ramon Escario, Nunez de Balboa, 29, MADRID.
Agents in Egypt and Syria: T. G. Mapplebeck, 48, Sharia Abdel-Khalek Sarwat Pasha, CAIRO, Egypt.

W. S. SHACKLETON LTD.

Offer for Sale

by arrangement with

WEST AFRICAN AIRWAYS CORPORATION & B.O.A.C.

SIX HANDLEY PAGE MARATHONS

and by arrangement with

THE SHELL PETROLEUM COMPANY LTD.

FOUR PERCIVAL PRINCES

W. S. SHACKLETON LTD.

175, Piccadilly, London, W.1.

Phone: HYDE PARK 2448/9 Cables: SHUCKHUD, LONDON

RELIABILITY

HYDRAULIC COMPONENTS

Airframe hours flown	1450
Aircraft in service	12
No. of hydraulic components	1000
Components confirmed faulty	2

LANDING GEAR

Total number of landings to date	22,572

An oleo has never failed on service causing a collapse.

Good-very good
-but not good
enough. H.P.

...int those concerned with the
...L.W. system in the [redacted]
...nd landings of the [redacted] fleet
...ted the hydraulic system under
...ic components are overhauled
...lent to 2,400 flying hours, but
...components are the original
... were new.

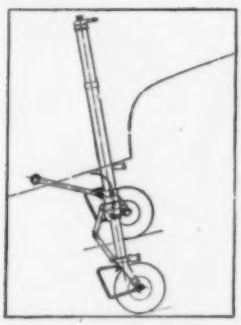
Our objective is ABSOLUTE RELIABILITY pursued by - Continuous research - Careful design - Vigorous testing - and precise manufacture

★ The facts quoted are taken from an internal Service report of one of our customers

ELECTRO-HYDRAULICS LIMITED
WARRINGTON

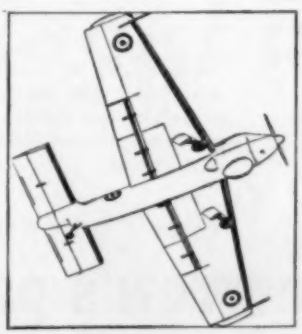
Coastal patrol — *Seamew* patrol

Because of its low landing speed, the Seamew can alight in an extremely small area. Tyre sizes can be easily changed to suit terrain.

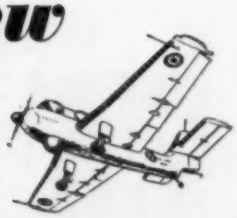


The two position tail wheel gives the advantages of a tricycle undercarriage layout for landing, while retaining the desirable features of the normal undercarriage for take-off.

Seamew—a tough, economical, all-weather submarine hunter. From an emergency coastal airstrip the Seamew can be airborne in a short distance to operate a wide-ranging patrol. It can conduct a maritime search with up-to-date radar equipment and use a variety of weapons to effect a kill. However rough-and-ready the airstrip, it can land back safely — with its low stalling and landing speeds and fixed, rugged, shock-absorbing undercarriage.



The *Short* answer is the *Seamew*



Generous flap surfaces contribute to the very low stalling and landing speeds. The Seamew is easy to fly and exceptionally manœuvrable

IN QUANTITY PRODUCTION FOR THE ROYAL NAVY

Short Brothers & Harland Limited, Queens Island, Belfast, N. Ireland. The first manufacturers of aircraft in the world.

The World's first

RETRACTABLE

AIRCRAFT BRAKE

Parachute

* As many as 30 complete release and retraction cycles per hour—at modern aircraft landing speeds—have been made possible by the use of this Napier Railton Test Vehicle.

GQ

Designed and developed for the Ministry of Supply by

designers of tomorrow's parachutes

THE G.Q. PARACHUTE CO., LTD., STADIUM WORKS, WOKING, SURREY

THE KING'S CUP

The Winners

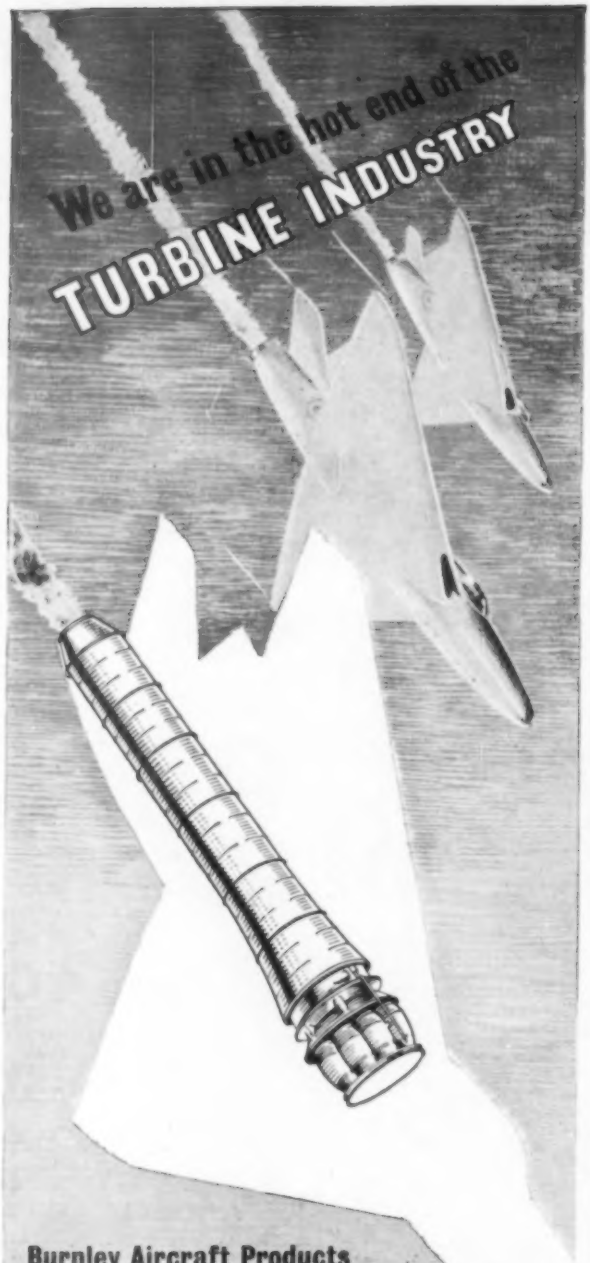
1ST Messenger OWNER: *T. C. STEPHENSON*
PILOT: *Flt./Lt. H. 'Tim' WOOD*

2ND Messenger OWNER: *Flt./Lt. M. D'ARCY*
PILOT: *Flt./Lt. M. D'ARCY*

The Engines

Blackburn Cirrus

Blackburn and General Aircraft Limited, Engine Division
Brough, E. Yorks



Burnley Aircraft Products

specialise in the development, repair & manufacture of jet pipes, exhaust units and discharge nozzles insulation blankets & bellows etc.

B·A·P

BURNLEY AIRCRAFT PRODUCTS LTD., FULLEDGE WORKS, BURNLEY, LANCS., ENGLAND

Tel. 3121 *ndh 3606*

AVIATION TRADERS
Limited

We can assist you in your Aircraft Spare Parts provisioning programme by offering you the resources available in our Air Registration Board Approved Stores, at Southend and Stansted Airports, Essex. Our Spare Parts are either new and unused or overhauled and released by the extensive A.R.B. approved workshops of our Associated Company, Aviation Traders (Engineering) Ltd.

We offer the following selections from our Stocks:—"Cannon" and "Amphenol" Plugs and Sockets, we hold extensive stocks, AN ranges 3100, 3102, 3106 and 3108 and "Cannon" Part Nos.; "AN Hardware," we can offer limited quantities of Bolts, Nuts, Screws and Washers in the "AN" range; 10H/2206 Socket, "Type 359," large quantities available.

AVIATION TRADERS (ENGINEERING) LTD.

MANUFACTURING CAPACITY

We shall be pleased to receive your enquiries for the following:—

TOWING AND STEERING ARMS

Owing to extreme shortage of availability we have designed, and are manufacturing, a towing arm, suitable for towing Douglas Dakota aircraft. Delivery approx. 14 - 21 days. Also "Percival Prince" Aircraft Steering Arms.

We can offer quotations for the manufacture of all types of Engine Slings and Engine and Power Plant Stands and Trolleys.

WANTED

Rotax Inverters, Type 100B, Part No. S2902.
American Inverters, Type PU16AP.
All offers to our *Buying Dept.*, address hereunder.

Please send all your enquiries to our SALES DEPARTMENT at

15 Great Cumberland Place
LONDON, W.1

Telephone:
AMBASSADOR 2091 (5 lines)

Telegrams: **"AVIATRADE, WESDO, LONDON"**
Cables: **"AVIATRADE, LONDON"**

high limit, low limit, high limit, low limit..

... how long does this go on? It went on for several weeks while we were putting the Nyloc through the Cold Flow test. We repeatedly transferred it from high limit to low limit bolts, testing the torque value all the time. The results showed the remarkable powers of recovery of the nylon insert, and how well it grips the thread of different bolts. The bolt makes its own way through the insert and the material moulds itself round the thread. There's no loosening effect from normal thread tolerances. In fact the only thing that moves a Nyloc is a spanner!

We have decreased the overall height and weight of the Nyloc without affecting its thread length and screwing torque. The nut is easier to use in restricted spaces.

The Nyloc Cap Nut has an insert and cap in one integral moulding. Used with a 'Dowty' Seal it gives a leak-proof seal suitable for use on pressurised cabins and fuel tanks.

Nyloc Stiffnuts

Enquiries to:

SIMMONDS AEROCESSORIES LIMITED

Byron House, 7-8-9, St. James's St., London, S.W.1. WHItehall 5772

Head Office & Works:—Treforest, Pontypridd, Glamorgan.

Branches:—Birmingham, Stockholm, Johannesburg, Copenhagen, Melbourne, Sydney, Amsterdam, Milan & New York

A MEMBER OF THE FIRTH CLEVELAND GROUP

CRC 13A

G.E.C.
ELECTRICAL EQUIPMENT

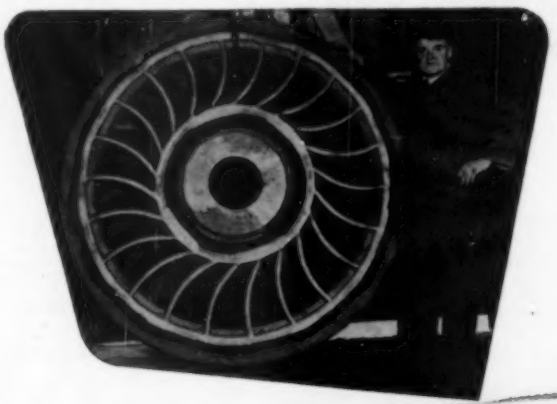
...IN THE B.O.A.C. BRITANNIA

B.O.A.C. sets a high standard of passenger comfort and serves excellent meals in its aircraft.

The G.E.C. Aeronautical Department has once again contributed equipment which will maintain the B.O.A.C. reputation for comfort and hospitality. G.E.C. equipment includes urns, ovens, beverage containers, hot cups, water heaters, humidifiers and reading lamps for passengers and crew, as well as passenger warning signs and fire warning bells.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

BIRSO
TRADE MARK



SPECIALISTS IN
HIGH-TENSILE
ALUMINIUM BRONZE
CASTINGS

from the **LARGEST**
to the **SMALLEST**

NON-FERROUS CASTINGS
MACHINED PARTS
CHILL-CAST RODS & TUBES

are supreme in their field

T. M. BIRKETT & SONS LIMITED · HANLEY · STAFFS
'Phone: Stoke-on-Trent 2184-5-6-7 — 'Grams: Birkett, Hanley

IN ASSOCIATION WITH

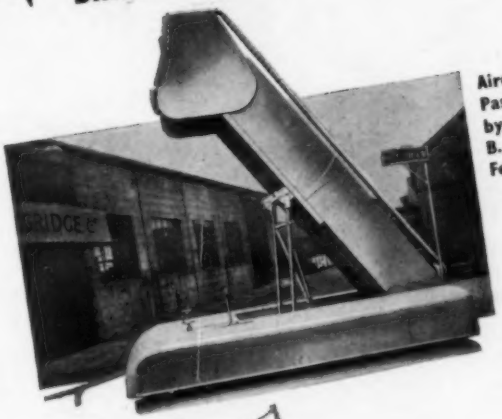
BILLINGTON & NEWTON LIMITED · LONGPORT · STOKE-ON-TRENT
'Phone: Stoke-on-Trent 87303-4 & 88147 — Grams: Bronze, Stoke-on-Trent

B.159

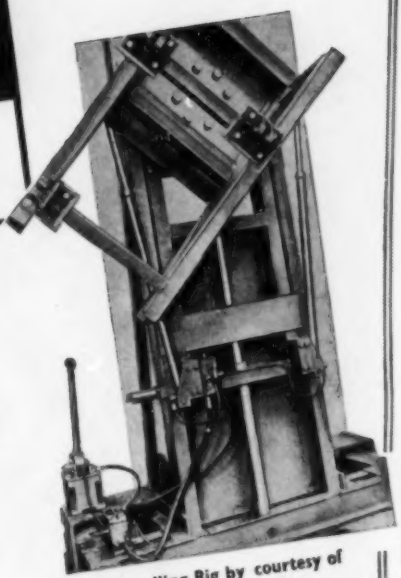
All POWERED BY POWER JACKS

Hydraulic LIFTING EQUIPMENT
HAND OR ELECTRICALLY OPERATED

BRING YOUR HYDRAULIC PROBLEMS TO US



Aircraft Passenger Gangway by courtesy of B. F. Collingridge Ltd. Feltham, Middlesex



Wing Handling Rig by courtesy of Folland Aircraft Ltd. Built by Talbot-Ponsonby Ltd.

Aircraft Servicing Platform by courtesy of Charles Hill and Son Ltd., Bristol

Hydratruck by Power Jacks Ltd., London

The above illustrations are typical of the wide application of Power Jacks Hydraulic Equipment to lifting and handling problems. Our Technical Advice Service is at your disposal.

A MEMBER OF THE NEWTON GROUP

Send for illustrated technical brochure. Publication No. J.223

POWER JACKS *LIMITED*

VALETTA RD. · ACTON · LONDON · W.3
TEL: SHEPHERDS BUSH 3443 (4 lines) · GRAMS: NEWSORBER, EALUX, LONDON

1058

The A·T·100

DUAL CONTROL TWIN ENGINE INSTRUMENT FLYING TRAINER

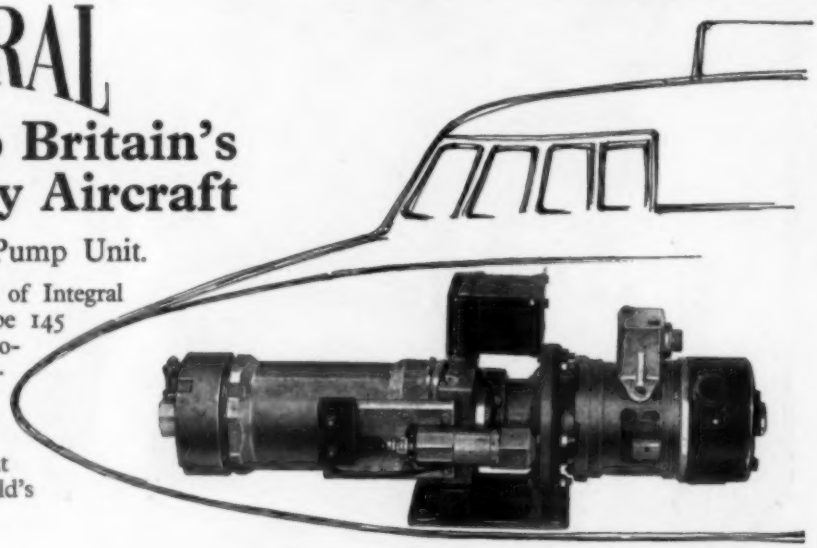
A new Ground Trainer designed to meet the demands of Air-line Operators requiring a Trainer with all the characteristics and the performance of a Modern Twin-engined Aircraft. Fully equipped with radio aids.

AIR TRAINERS Ltd.

AYLESBURY · BUCKINGHAMSHIRE TEL.: AYLESBURY 922-3-4

INTEGRAL

pumps fitted to Britain's Civil & Military Aircraft



The Type 145 Motor Pump Unit.

One of the latest of a series of Integral Motor-Pump Units, the Type 145 in the Bristol Britannia prototypes — Britain's latest long-range Turbo-Prop Air Liner.

Many of the earlier units are still giving highly efficient service in a variety of the world's commercial aircraft.

A light and compact self-contained unit, comprising electric motor, two-stage gear pump, hydraulic accumulator and automatic control devices, the Type 145 is available in two versions:

MARK 1 Continuous running blast-cooled motor. Pump on and off-loaded by solenoid valve at pre-determined pressures.

MARK 2 Fan cooled motor with "stop/start" pressure operated switch. Thermal switch operates excess temperature warning light.

Both Marks have excess pressure relief valve, and may be arranged for operation at pressures up to 1500 lbs./sq. in.

INTEGRAL LTD., BIRMINGHAM ROAD, WOLVERHAMPTON. Telephone: Wolverhampton 24984

Availability... the key-note

In May 1950 Westland Aircraft organised and flew Europe's first licensed Helicopter passenger daily service between riverside London and the British Industries Fair at Birmingham, in British built, British engined S-51 Helicopters. Then followed pioneer route-proving services by British European Airways during 1951/3.

Belgium for some time past has linked her four major cities with others in France, Holland and Germany using single-engined S-55 Helicopters.

Now, mounting experience of safe single-engined Helicoptering has led B.E.A. to order Westland S-55 Helicopters for the new service, London Airport to the South Bank landing site.

Despite the weight of the amphibious landing gear the Westland S-55 remains Britain's largest capacity Helicopter in full production.

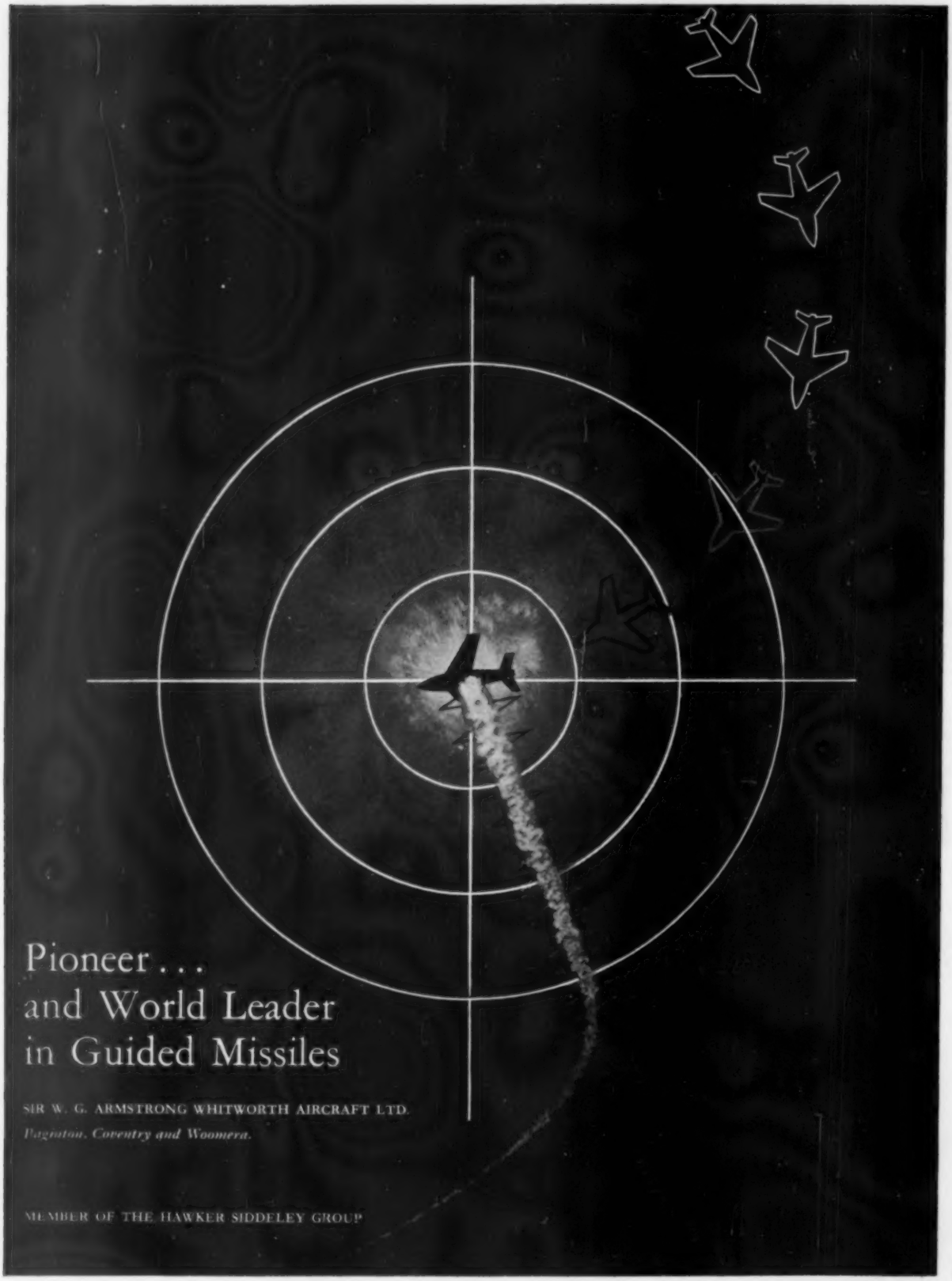
"Availability"—the outcome of Westland's private enterprise.

WESTLAND S.55 HELICOPTERS

Built in Yeovil from British materials to British design standards

WESTLAND AIRCRAFT LIMITED · YEOVIL · ENGLAND

C


Pioneer . . .
and World Leader
in Guided Missiles
SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD.
Baginton, Coventry and Woomera.
MEMBER OF THE HAWKER SIDDELEY GROUP

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World

Founded 1909

No. 2372 Vol. 66. FRIDAY, 9 JULY 1954

EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices:

DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:

COVENTRY
8-10, Corporation Street.
Telegrams, Autocar, Coventry.
Telephone, Coventry 5210.

BIRMINGHAM, 2
King Edward House,
New Street.
Telegrams, Autopress, Birmingham.
Telephone, Midland 7191 (7 lines).

MANCHESTER, 3
260, Deansgate.
Telegrams, Iliffe, Manchester.
Telephone, Blackfriars 4412 (3 lines).
Deansgate 3595 (2 lines).

GLASGOW, C.2.
26b Renfield Street.
Telegrams, Iliffe, Glasgow.
Telephone, Central 1265 (2 lines).

SUBSCRIPTION RATES
Home and Overseas: Twelve months £4 10s. U.S.A. and Canada, $14.00.

IN THIS ISSUE:

Weapons on West Down 36
Atomic Power - - - - 39
The Avro 504 - - - - 41
Instrument-panel Developments - - - 45
Meeting National de l'Air 47
Trans-Pacific - - - - 50
Martin Matador - - - 52
Gamecock and Peregrine at Home - - - - - 61

Fixes—or in a Fix?

ONE hears less about automatic flight than was the case four or five years ago, in spite of the fact that in several branches of aviation the knowledge and the state of the art have advanced very considerably. No one has attempted to emulate the achievement of the C-54 Skymaster which in September 1947 flew the North Atlantic from Stephenville, Newfoundland, to Brize Norton in Oxfordshire where it landed unaided by the human "co-pilots." Captain T. J. Wells of the All-Weather Flying Division, U.S.A.F. Air Materiel Command, had only to line the aircraft up on the runway for take-off and to apply the brakes at the end of the landing run many hours later. This flight might fairly be described as a worthwhile stunt.

In some ways commercial aviation has drawn ahead of military practice in the matter of automatic approaches, and the linking-up of the automatic pilot with a standard approach aid is becoming an accepted procedure. This very week K.L.M. is laying claim to being the first European airline to employ automatic approach equipment in the form of an approach coupler which feeds signals from the radio approach system direct to the automatic pilot. A statement from the company indicates that hitherto the descent from 5,000ft had to be carried out manually, "a procedure which called for very quick reaction on the part of the pilot." K.L.M. machines were among the first to be fitted with Zero Readers. Even so, in the field of entirely automatic flight (including landing) military aircraft will almost certainly continue to pave the way.

The possibility of a civil airliner with a load of passengers flying automatically with no more than a machine-minder for crew seems remote enough now, but perhaps it will come one day. It is but a few years since voices were loudly raised against even the thought of a ground controller, using nothing but radar "blips" for guidance, instructing a pilot in the air how to bring his aircraft down in instrument flight conditions. Today more than 90 per cent of civil instrument approaches are G.C.A. aided.

Serious talk of unmanned military aircraft started many years ago, and the days of the manned fighter have on many occasions since the war been prematurely numbered. It seems that piloted intercepters will be with us for some while to come, in spite of guided-missile and guidance-mechanism developments. So long as aircraft are man-flown the knowledge of one's exact position in the air is advantageous throughout a flight and essential during parts of it.

Certain features of piloted flight in bad weather and at night are obviously common to all branches of flying: for example, the need to get down safely at the destination or an alternative airfield and to keep an accurate check on one's track and position along it. A large number of accidents—the majority, even—have stemmed from crew or instrument shortcomings under these broad headings. As a result many approach, landing and navigation aids have been devised.

Much work remains to be done; but there is a risk that more complicated and more numerous devices will lead to reduced overall reliability and increased chance of human error. A crew is much better off in this respect than the solo pilot of a fighter. With currently used aids and conventional plotting, aircraft on occasions still hit mountains, land at the wrong airfield and ditch unnecessarily. Jet fighters are destroyed because pilots lose track of their position and run out of fuel before they can re-orientate themselves and land at the nearest base.

We would suggest that the need for a single simple continuous and independent position-fixing instrument whose presentation requires the minimum interpretative effort and no mental calculation on the part of the pilot has not yet been fully met. For the larger aircraft, with two or more crew, a chart-type presentation may be one of the best answers; for the fighter pilot one step further may be preferable. A pilot knowing his position must next calculate his course for home; thus a direction pointer and distance indication, automatically tuned to the nearest of several preselected airfields, may be all he needs, and even all he has time for, or the cockpit space to accommodate. These requirements present no new technical problems. There are several widely used and well known devices. In addition Qantas already use a simple and very accurate Australian D.M.E.; and, incidentally, car radios in America are made automatically to tune in on the best station in the area in which they are travelling.

FROM ALL QUARTERS

New Noises

RECENT "outsize" sonic bangs heard along the Sussex coast have coincided with the appearance of a high-flying Gloster Javelin all-weather fighter. The Javelin was, of course, designed to have transonic capabilities, but these were not realized until recent weeks. Flight-development is in the hands of W/C. R. F. Martin.

Incidentally, three Hawker Hunters seen in formation over Surrey last Monday presented a most distinctive appearance, and an even more distinctive noise, quite unlike that to be expected of "one Hunter multiplied by three."

Congress Vetoes British Procurement

THE U.S. House of Representatives on June 29th deleted from the Foreign Aid Bill a provision for financing $75m (£26,785,000) worth of aircraft procurement in the United Kingdom. By a vote of 85 to 50, the House approved an amendment—offered by Representative Bentley (Republican)—to strike the item from the bill.

Mr. Bentley said that a similar item in last year's Bill, providing 85,000,000 dollars (£30,356,000) for British aircraft procurement, had not yet been spent; the money, therefore, remained available for that purpose. A further grant, he claimed, would simply allow the British aircraft industry to expand its competition with the U.S. industry, since the bill did not specify that the money must be used for military aircraft.

Representative Hinshaw (Republican) said that British competition in commercial aircraft was "already far too tough" for the U.S. industry, which had been too busy concentrating on the output of military types to concentrate on civil developments.

An Administration appeal against adoption of the amendment, on the grounds that the money would help strengthen the R.A.F., and therefore the free world, was rejected, and the amendment was carried by a standing vote.

Road to Rio

THE chairman of the English Electric group, Sir George H. Nelson, recently completed a 20,000-mile tour of Central and South America and the Caribbean. The tour, which was sponsored by the Treasury, the Board of Trade, the Ministry of Materials, the Foreign Office and the Federation of British Industries, included a large number of official visits intended to explain the British industrial situation and to explore the market for British goods.

In one of his addresses to various groups Sir George said: "I am here because Britain can now respond to the demands which may be made upon her." He was able to report on his return that there were vast resources still to be exploited in the areas he visited and that the opportunities for efficient British salesmanship were legion.

New U.S.A.F. Command

IT is reported from Washington that the U.S. Air Force is to establish a new command in the Pacific next month to strengthen its ability to meet any emergency in the Far East. The command, part of Admiral Stump's unified Pacific Theatre Command, is apparently being set up in preparation for planned re-deployment of forces now concentrated in the Japan-Korea area. The action also coincides with the announced movement of Strategic Air Command units from the United States to Pacific bases for rotational training.

The new organization, which will be called the Pacific Air Force, and which will have headquarters at Hickam Air Force Base, Hawaii, will have two main duties—helping to prepare joint emergency planning at Admiral Stump's Pearl Harbour headquarters, and running the Pacific air supply and communcation lines.

The new command will cover a vast group of Pacific air bases now operated by several units, particularly those of the Military Air Transport Service, which will thus be freed for its main task of flying military personnel and supplies. The command's area stretches from the U.S. West Coast to Asia and includes the U.S.-occupied Pacific islands, U.S. bases in the Philippines and military assistance groups in Indo-China and Formosa.

The command is not expected to operate tactical units other than certain defence units of its own; combat units are apparently to remain under control of the U.S. Far East Air Forces Command.

S.A.A.F. Reserve Pilots

THE South African Air Force has a sound reserve of trained pilots, the members of which, in the event of an emergency and after a short training period, would be available for war service, said the Air Chief of Staff, Brigadier H. G. Wilmott, in a recent interview in Pretoria.

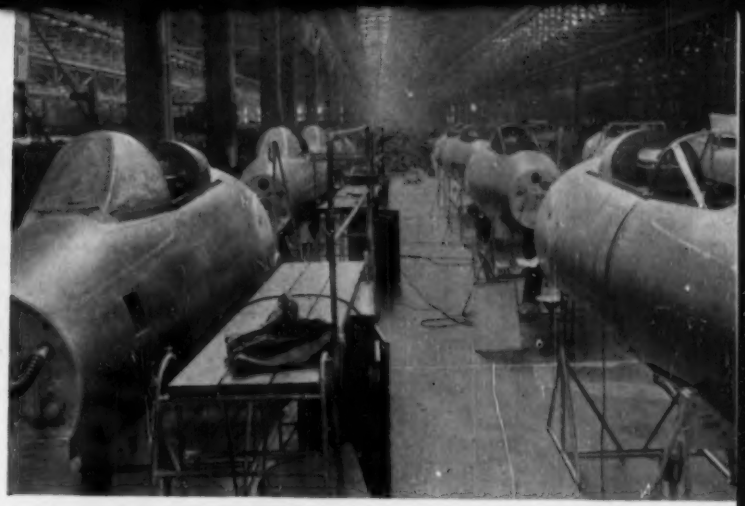
All pilots who served in the last war and who were not older than 36, as well as other officers who served in the different branches of the South African Air Force, were eligible for the reserve.

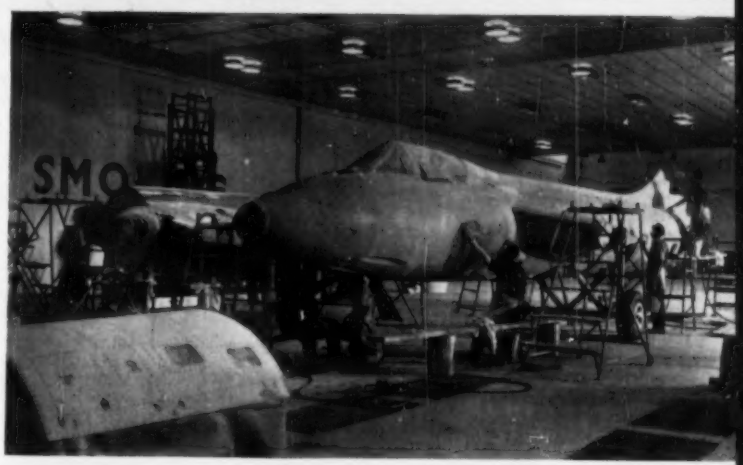
The number of pilots trained to "wings" standard under the post-war pupil pilot training scheme since it was started in January 1948 was 300; many of them had served with No. 2 Fighter Squadron in Korea. The scheme, however, had been discontinued, and all South African Air Force pilots now received their training through the Air Force Gymnasium.

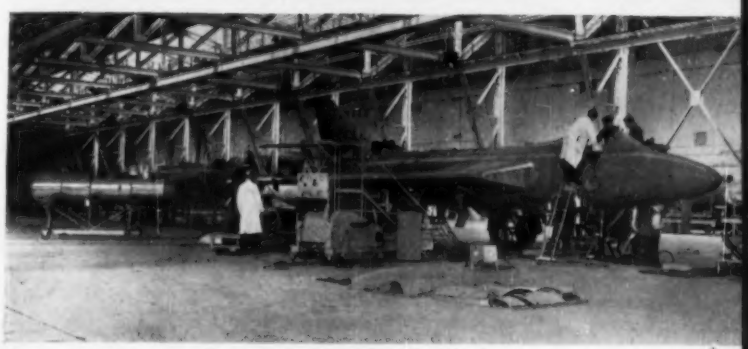
Those pupils under training when the Minister of Defence announced the closing of the scheme would continue tuition until they received their wings. The last group qualify early in 1955. The training would be done at Durban, Wonderboom, Baragwanath, Germiston, Bloemfontein, Youngsfield and Port Elizabeth.

THE DUKE AND THE DJINN: During his recent visit to Paris, as recorded last week, the Duke of Edinburgh visited Bretigny, France's Boscombe Down. He is seen (left) inspecting the Palouste-turbine-powered S.N.C.A.S.O. Djinn helicopter, now going into production (it is to be marketed in the U.K. next year, at about £7,000, by Helicopter Sales, Ltd.). In the group are, on the left, M. Georges Glasser, S.N.C.A.S.O. president, and Ing. Gen. Mazer, technical and industry director of the French Air Ministry; on the right, M. Diomede Catroux, Secretary of State for Air.

FOUR GENERATIONS: The unique picture below, showing three types of North American fighter—an F-86 Sabre, F-51 Mustang and F-100 Super Sabre, flying past a reconstructed Spad, was secured at the U.S.A.F. "gunnery meet" at Nellis Air Force Base, near Las Vegas, Nevada. Respective maximum speeds of the aircraft, in the order mentioned, are 670/700 m.p.h.; about 460 m.p.h.; over 750 m.p.h.; and 120 m.p.h.







BLACKPOOL'S HUNTERS: Last Monday, Princess Margaret visited the Hawker Hunter factory at Squires Gate, as recorded on this page. Reading clockwise from the top, these photographs show: detail assembly proceeding on a Hunter centre fuselage, removed from its jig; front fuselages, almost ready for the erection shop; part of the brilliantly lighted paint shop, with a Hunter (standing on its nosewheel and a rear trestle) being sanded preparatory to being camouflaged; and the final erection shop, with the first machine having functional tests.

Blackpool Hunters

THE Government-owned aircraft factory on Squires Gate airport, Blackpool, is the largest industrial plant in West Lancashire, and it produced thousands of aircraft—mostly Wellingtons—before 1947. Used as storage space for four years, it was re-opened in 1951 and the Hawker Aircraft Company has since undertaken a huge programme of tooling-up to build the Hunter, including the construction of a new 2,000-yd runway and the recruiting of an eventual labour force of over 5,000.

At Blackpool, Hawkers do everything connected with making Hunters except design-work; and, as was recently pointed out (*Flight*, May 7th) all components are interchangeable with those of Hunters made at Hawker's own factories, or at Coventry, or in the Low Countries. The revealing photographs on this page are the first depicting Hunter production at Blackpool. They show some of the work inspected by Princess Margaret when she visited the big factory last Monday. Later, from the bridge of a fishery protection vessel in Fleetwood Bay, she heard S/L. Neville Duke produce a sonic bang.

Helicopters in Parliament

IN reply to a question in the Commons on June 30th Mr. J. P. L. Thomas, First Lord of the Admiralty, said that there were approximately 100 helicopters in Royal Naval service (Dragonflies, Hillers and Whirlwinds) and that a further 100, all British, were on order.

Mr. L. D. Gammans, Assistant Postmaster-General, said that there were no immediate plans for renewing civil helicopter mail services. Similarly, Mr. J. D. Profumo, Under-Secretary for Civil Aviation, said there were no plans for expanding experimental helicopter services at public expense. The Minister was, however, always ready to consider proposals for new services supported by private funds.

Canadian Bristol Appointment

AN announcement by the Bristol Aeroplane Co., Ltd., states that A.V-M. A. L. James, C.B.E., C.D., B.Sc., D.I.C., F.R.Ae.S., M.E.I.C., will join the board of the Bristol Aeroplane Company of Canada, Ltd., and of its subsidiary, Bristol Aero Engines, Ltd., on September 1st; he will also become vice-president (engineering) of the latter company. A.V-M. James, who joined the R.C.A.F. in 1924, was most recently A.O.C., Air Defence Command, in which post he was responsible for the Canadian part in the North American Air Defence system. He graduated from McGill University and took a post-graduate course at the Imperial College of Science and Technology in London. In 1929, he was a pilot at the R.A.E. Farnborough.

A.V-M. James

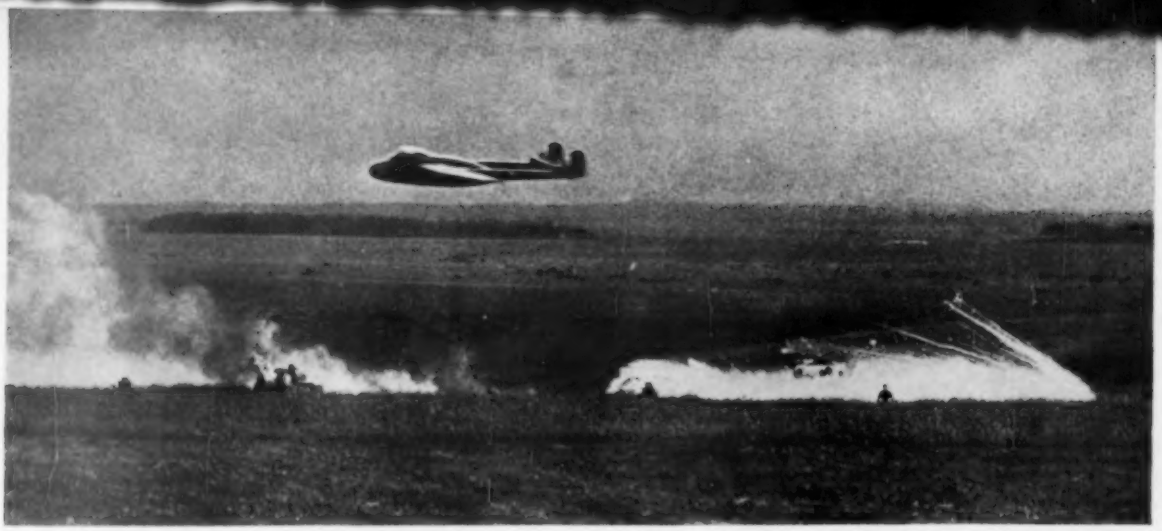
Bristols also announce that negotiations are in progress to acquire Macdonald Brothers Aircraft, Ltd., of Winnipeg for the Bristol group for a reported price of £1m. This company is engaged on aircraft repair work and on the manufacture of sheet metal components for jet engines.

OTHER AIR NEWS

REPORTS from Australia and America speak of British development of ground-air, air-air and air-ground guided weapons. At least one 2,000 m.p.h. (Mach 3) ground-air weapon now on test at Woomera is stated to be a beam-rider to a point in the vicinity of its target, from where it "homes" automatically.

RECENTLY formed in Austria, with official British and Austrian support, is the Alpine Air Rescue Service, which will include parachute teams of doctors, mountaineers and dog-trainers. The headquarters of the organization is in Graz, British Zone; technically, such a development is not permitted by the Allied Council, and Russia has protested. Five aircraft are expected, on loan, from the Swiss air rescue service.

AN order has been placed by the Royal Canadian Navy for British precision approach airfield radar equipment, to be installed at R.C.N.A.S. H.M.C.S. *Shearwater*, Dartmouth, Nova Scotia. The equipment is to be manufactured by Standard Telephones and Cables, Ltd. It provides traffic control and precision approach facilities on two radar scopes in the control tower, fed through a radio link from trailer-mounted radar beside the runway in use. The trailer contains two 50 kW radar transmitters radiating a pulsed fan beam in the 3 cm band from two aerials. At ten miles the swept space is approximately three miles by one mile.



A Vampire from Fassberg releases its napalm tanks, or fire bombs as the Air Ministry prefers to call them, on one of the lowest runs

WEAPONS on WEST DOWN

Spectacular Demonstration by Four Services

FOR the benefit of the R.A.F. Staff Colleges at Bracknell and Andover, and the Joint Services Staff College at Latimer, an air-weapons demonstration was put on at West Down range, Salisbury Plain, on July 2nd. The lengthy programme was planned by the School of Land/Air Warfare (Commandant, A.V-M. G. Harcourt-Smith, C.B., C.B.E., M.V.O.), and must have provided useful data for the Operations branches of the Air Ministry. Mr. Duncan Sandys, the Minister of Supply, was a spectator.

Item No. 1 was a dive-bombing demonstration by eight Sea Fury F.B.11s of No. 801 Sqn., Fleet Air Arm, each with two 500-pounders. Their leader called for red smoke to mark the general area of the target, and distant Army gunners promptly complied. After some difficulty with cloud—which persisted sullenly—the 'Furies were able to position themselves for their peel-off and bombing dive. Then, two by two, the "500s" plummeted into the designated artillery area, flashed red, and spurted up their grey-brown fountains of earth and smoke, jolting the writer's memory back to a busy morning over the battle-front of Korea, and reminding him that "801" are but lately home from the war there.

As the 'Furies pulled out, their blunt wing-tips stirred up livid wakes in the moisture-laden air. The commentator (who, of course, was bent on driving home advanced lessons in the art of war, and not on diverting his distinguished and gallant audience) saw fit to remark that artillery was no easy target for fighter/bombers, for there was no guarantee that they could destroy the actual guns. Long-delay fuses, therefore, were useful in keeping things stirred up, though for the purposes of the demonstration the bombs were fused only for ·025 and ·015 seconds delay. The low cloud-base further detracted from the realism, if not the spectacle, of the occasion, for in face of the intense light flak (which they could expect) the aircraft would dive from about 5,000ft, aim at an angle of 45 degrees or so, and pull out at 1,000ft.

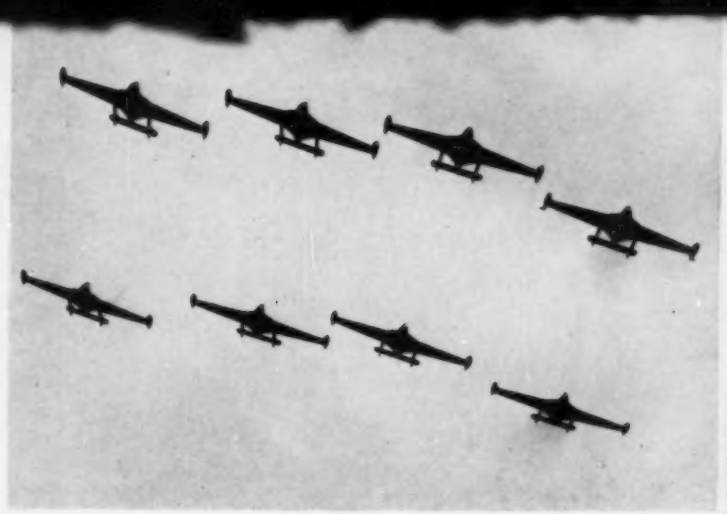
Having been assessed "not bad," the Naval fighter/bombers re-formed for a series of strafing runs on a dump of 200 old Jerricans, only the two bottom layers of which contained petrol. The 20 mm Hispano gun (of which each machine was using its complement of four) was described as the most accurate weapon available to the tactical air force, and the 801 pilots got results in the form of a palpable, if gradual, brew-up. They left at low level for Lee-on-Solent and lunch.

Eight Venom F.B.1s of No. 266 Sqn (temporarily based at Odiham), next brutally assaulted with salvoes of R.P.s a brace of time-expired tanks, which, so far as one could see, were lying peacefully derelict in their old age, and doing no harm to anybody. The 60 lb high-explosive R.P. is generally effective from a range of 500-1,000 yd, and the delivering aircraft dives from 3,000-4,000ft, takes up an angle of 20-35 deg, and releases 800-1,000ft above ground level. A steady dive is, of course, absolutely vital to success, so the aircraft itself presents a vulnerable target. A direct hit on a tank is the only guarantee of a kill, though a miss by one or two feet might damage a track. The infantry themselves have more accurate anti-tank weapons, and the fighter/bomber must always find an isolated tank extremely difficult to pick off. A really worthwhile objective would be a whole squadron of tanks in a refuelling area, but M.T., pontoon bridges, ships, radar installations and locomotives are not despised as R.P. recipients. Against armour, shaped (or hollow-charge) heads are appropriate.

With semi-armour-piercing incendiary and high-explosive shells from their 20 mm Hispano guns the Venoms next addressed themselves to an array of M.T. and aircraft, including a selection of Spitfires and a silver Meteor. One vehicle was seen to be aflame, and, had the tanks of the aircraft been full, its fiery end would doubtless have been shared.

"FLIGHT" photographs

A stick of six 1,000 lb bombs from a Bomber Command Canberra.



(Left) Venoms of No. 266 Sqn, 2nd Tactical Air Force, introduce themselves before breaking for their attacks, one of which is seen on the right.

Four Vampires from the Central Gunnery School, Leconfield (temporarily flying from Tangmere), attacked—with great accuracy, it appeared—some artillery emplacements. Their weapons were auxiliary fuel tanks filled with inflammable material, differing somewhat from the American napalm, and the tanks had been specially made up for the occasion, for no stocks are normally held by the R.A.F. The limiting speed and height for release were quoted as 350 kt and 50ft, and—flak and terrain permitting—surprising accuracy can be achieved, with less training than for R.P. work. (The pilots in this particular demonstration, we believe, had dropped napalm only twice before.) Should the area under attack contain little or no inflammable material, burning time would be short; but as a result of the demonstration-attacks the tyres of some six-pounder guns were set aflame.

A later Vampire/napalm demonstration—by the wing leader at Fassberg, and one of his squadron pilots—was directed from a singularly low level against two tanks, one open, one closed. No description of this event will be needed if the photograph on the opposite page is examined.

To illustrate the capabilities of light bombers in close support of ground forces, six Canberras (two markers from No. 110 Sqn and four—constituting the main force—from No. 10) were asked to deal with an infantry strong-point. This they did by putting down 250 lb red target indicators in diving approaches and bombing on them with six 1,000-pounders apiece. They were aiming visually, though, as is well known, under radar control they can achieve a high standard of accuracy irrespective of weather or light. Once again the clouds were a nuisance, and some runs were abortive; but without knowing the ultimate results (they appeared indifferent), one can readily assess this demonstration as highly educational to the observers. It was, in any case, most interesting, for one heard, with fair clarity, the R/T. traffic ("Where the hell have you been"; "Wind 309 degrees, 11 knots—30911"; "Master bomber to main force—you are clear to bomb" and so on); and the sight of sticks of thousand-pounders tumbling down from just beneath, or in the intervals between, clouds, was not one that can be seen every day.

It was a matter of some regret that ordinary H.E. bombs were dropped, and not, as had been planned, those of the new—still experimental—V.T.-fused variety. The V.T. (variable-time) fuse may be set to explode the bomb at pre-determined heights above the ground. Fragments and blast are directed downwards over an area which can be varied according to the height of the burst, and the bomb would normally be employed against troops, vehicles, aircraft on the ground, and a variety of other targets susceptible to blast or fragmentation.

From their temporary base at Odiham, four Venoms from Nos. 16 and 94 Sqns, 2nd T.A.F., were now called in to rocket an artillery area; and again, the relative inaccuracy of the rocket projectile was emphasized. Frequently, it was explained, a near miss results, regardless of accuracy of aim.

Though not enabled to assess the accuracy of the Venoms' rocketing we can vouch for the effectiveness of their gunfire against a petrol dump, and we were reminded that "20-mil" is effective against radar, locomotives, soft-skinned transport on the road, pontoon bridges, to some extent tanks (especially when these are cruising with reserve fuel carried externally, and with turrets open), and that the war proved that about 25 hits on a locomotive could put it out of commission for a fortnight.

The Venoms made a very low, and altogether impressive, withdrawal; but just as impressive, in every aspect of their demonstration, were four F-84 Thunderjets of the Belgian Air Force. Their primary purpose was the napalming of some tanks, but they subsequently strafed with their six 0.5in guns. The Thunderjets were using American-type napalm tanks, which, because of their fusing arrangements, necessitate release from a noticeably greater height than is possible with the British tanks (which, as already explained, are simply auxiliary fuel tanks, filled with special material).

The F-84, it was remarked, carries a war load equivalent to that of the Mosquito and, with tip tanks, has a radius of action of 400 nautical miles at low level. Its guns fire at the rate of 1,200 rounds per minute and at a muzzle velocity of 2,900 ft/sec. Each is provided with 300 rounds, and one noted that the Belgian pilots fired in long bursts, the volume and intensity of which exceeded that of the 4 × 20 mm armament of the British fighter/bombers.

Finally, from their Yorkshire base, two more Canberras each plastered an artillery area with sticks of six 1,000 lb bombs, fused nose and tail, at about 50 yd intervals. The bomb-aimers could be heard over the address system giving their instructions to their pilots, and their "left-left, left-left, left-left—steadies" were a reminder that techniques and weapons of the present-day tactical air force are, in general, far less advanced than the available aircraft.

H.F.K.

Two Thunderjets of the Royal Belgian Air Force pull out of their dive, having strafed with their 0.5in guns.

HERE AND THERE

ARCTIC SHADOWS: A Piper Cub of the U.S. Wild Life Service in Alaska throws a protective, if temporarily alarming, shadow over three moose during a recent census. Game-warden pilots of this service help to enforce laws limiting the number of animals which may be taken. Newfoundland's Premier, Mr. Joseph Smallwood, recently made the disturbing statement that "literally thousands of moose and caribou have been machine-gunned from aircraft," and it is feared that animals are also being used for military target practice in parts of Canada and Alaska.

Royal Purchaser

SHOWN at the recent London inaugural exhibition of the Society of Aviation Artists, the painting *A Royal Precedent*, by Lester Wilcox, R.I., S.M.A., has been purchased by the Duke of Edinburgh. The picture records the first occasion on which His Royal Highness made a helicopter journey from the grounds of Buckingham Palace.

Wills' New Record

A NEW British speed record for sailplanes was set up by Philip Wills on Sunday last during a flight from Lasham to Detling. The distance of seventy-one miles was covered in the same number of minutes, the average speed achieved (60 m.p.h.) being a 12-m.p.h. increase over the previous record, set up by Wills on Whit Monday between Lasham and Cambridge.

Deoxygenated Owl

A METEOR 7 made two trips to 25,000ft recently, before it was discovered that there was a third occupant—a barn owl—hiding behind the instrument panel. The bird was jaded but undamaged, and was last reported making satisfactory progress in Cheltenham R.S.P.C.A. clinic.

A Mystery Witnessed

THE captain, and all but one of the crew, of a B.O.A.C. *Monarch* Stratocruiser which, on July 1st, was 150 miles south west of Goose Bay at 19,000ft in clear weather, saw a large object, accompanied by six smaller objects, fly parallel to them for 80 miles. The objects disappeared just before a fighter, scrambled to intercept, reached their position. The objects proved quite unidentifiable, but crew members and passengers are certain they saw them.

Scientist's Industry Appointment

WELL KNOWN for his aeronautical research work in earlier years, and appointed Chief Scientist of the Ministry of Fuel and Power in 1948, Sir Harold Roxbee Cox resigned from that post on June 30th in order to join the Board of Wilmot Breeden (Holdings), Ltd., the Birmingham car-accessory manufacturers. He held a succession of increasingly responsible posts at Farnborough in the inter-war years; was Deputy Director of Scientific Research at M.A.P. from 1940 to 1943; Director of Special Projects in 1943-44; chairman of Power Jets (Research and Development), Ltd., in 1944-46; and Director of the National Gas Turbine Establishment for two years before joining the Ministry of Fuel and Power.

Before Leaping . . .

A COMPUTER has been developed by two R.C.A.F. officers to calculate the dropping point for airborne troops or stores according to wind and height. The computer is designed for use by navigators and is reported to have been adopted by the U.S.A.F. as well as by the R.C.A.F.

Air League Ball

THE Air League Ball was held on June 29th at The Dorchester, London, in aid of the funds of the Air League of the British Empire. Guests were received by Lord De L'Isle and Dudley, by Lady Handley Page and by Viscount Templewood, president of the League. The R.A.F. was represented by Air Chief Marshal Sir Ronald Ivelaw-Chapman, Deputy C.A.S., and the Navy by Rear Admiral A. N. Bingley, Fifth Sea Lord.

A Place in the Sun

THE German Federal Minister of Transport, Dr. Seebohm, speaking to the members of the German Aero Club at the recent aviation conference in Brunswick again demanded complete air sovereignty for the Federal Republic and immediate removal of all restrictions from the sport of flying with powered aircraft. Air sovereignty could not be withheld permanently from the Federal Republic, and he hoped German civil aviation could be started by the end of the year. He advocated the development of aviation and aeronautical research for peaceful purposes.

More Off-shore Sea Hawks

A FURTHER off-shore contract worth $5m (£1,927,000) for Hawker Sea Hawks to be produced by Sir W. G. Armstrong Whitworth Aircraft Ltd., Coventry, was signed at the Ministry of Supply on June 30th by Capt. J. G. O'Handley, U.S.N., and Mr. J. L. Gray of the M.o.S. This order follows one worth $13m for 107 Sea Hawks placed last year with the same company. The eventual recipients of these aircraft have not yet been named.

Air Touring Contest

THE Royal Aero Club reminds intending entrants for the National Air Touring Competition that the closing date for entries (fee, £5 in each section) is Wednesday, July 14th. The competition is being flown from Cranfield Aerodrome on August 14th.

Hitting Sydney

AT the end of last month, American aircraft joined with the R.A.A.F. and Australian Army in the most extensive military exercises to be held in Australia since the end of World War II. Most of the air activity centred over Sydney and Newcastle, N.S.W., and the attacking force claimed the destruction of Sydney Harbour bridge.

BELIEVE IT OR NOT, this "Flight" photograph was taken a few days ago—at Iver, Bucks, and not outside Vickers' works in 1918. It shows the full-size replica of Alcock and Brown's historic trans-atlantic Vimy, built by Shawcraft Models for a film since in abeyance. Carefully dimensioned drawings were made from the original, now safely held in the custody of the Science Museum.

100,000 HOURS

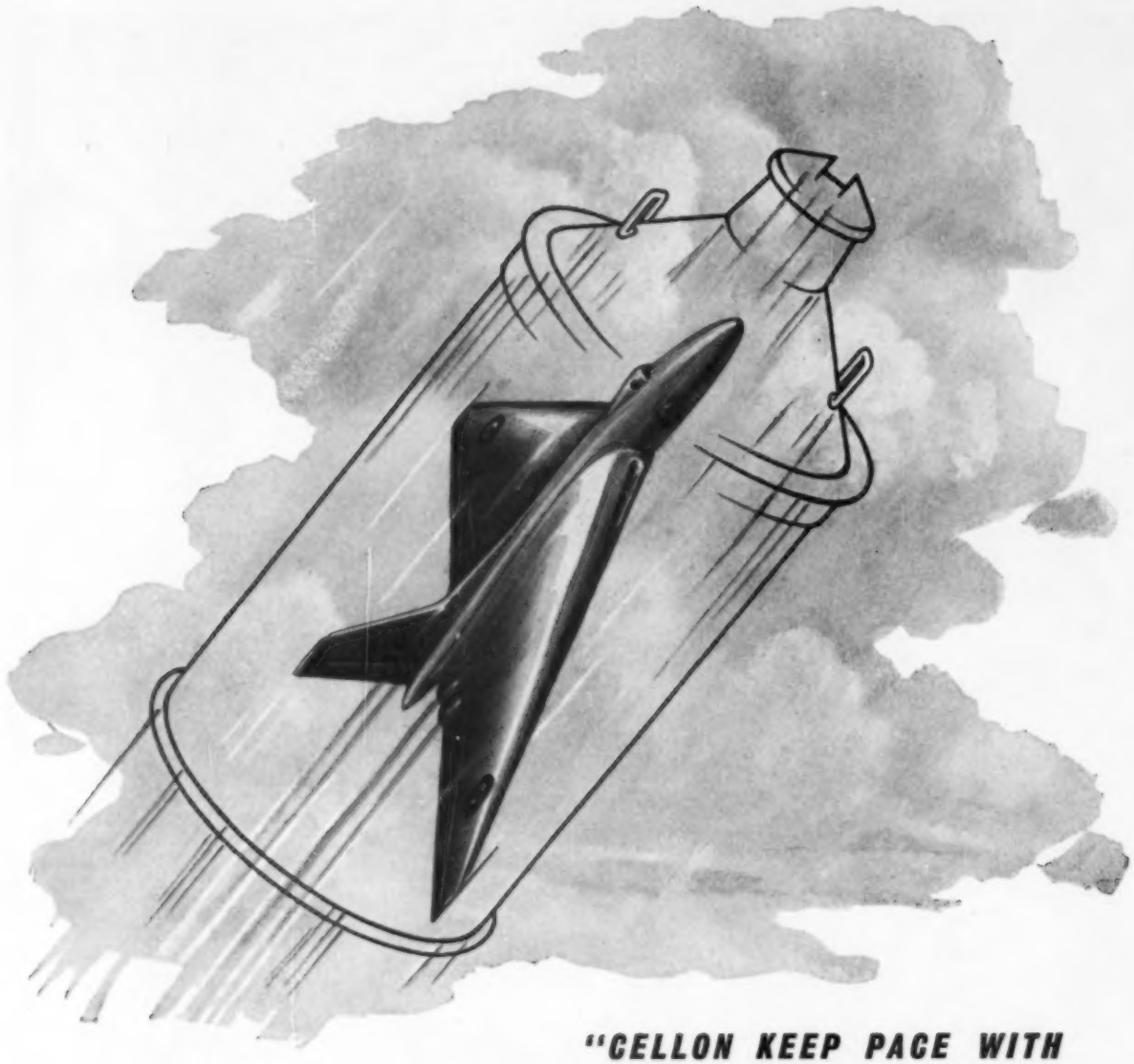
The Flying Times of

ROTOL Propellers and Accessory Drive Equipment on Airline operated Viscounts stand at over 100,000 hours.

These hours have accumulated on British European Airways, Air France and Aer Lingus routes during the past twelve months proving reliability under all weather conditions.

ROTOL

GLOUCESTER · ENGLAND



"CELLON KEEP PACE WITH AERONAUTICAL DEVELOPMENT"

A constant awareness of the new demands which aircraft manufacturers and designers will be asking of their materials; the advanced research equipment and technicians with which to anticipate these new demands; and the all-important factor of resistance to new lubricants are just some of the reasons why Cellon always have and always will dominate the field of Aircraft Finishes. And those who have established Britain's lead in world aeronautics development know full well the important part the finish plays at modern flying speeds. Proof? You'll find a Cellon Aircraft Finish on our most advanced planes!

CELLON
AIRCRAFT FINISHES

CELLON LIMITED KINGSTON-ON-THAMES SURREY *Phone: Kingston 1234 (7 lines) Telegrams: AJAWB, Phone, Kingston-on-Thames*

Also Manufactured in AUSTRALIA CANADA FRANCE HOLLAND NORWAY

CVS-753

ATOMIC POWER

Notes on Some of the Problems Involved and N.A.C.A. Research

THIS journal has on several occasions published accounts —usually, of necessity, largely theoretical—of the development of, and the prospects offered by, aircraft atomic power units. On these two pages is a further contribution, which is designed not only as an introduction to the subject but also as an account of practical experimental work aimed at solving some of the more fundamental problems involved.

In any discussion of atomic power it seems logical to start at the atom itself. Most readers will probably already have a fair idea of what constitutes a chain reaction; briefly, such a reaction takes place when free neutrons within a block of fissionable substance knock off other free neutrons at a greater rate than the rate at which they are lost to atmosphere or captured by non-active matter. In an uncontrolled chain reaction the process can build up with great rapidity, so forming an atomic bomb. It is, however, possible to damp down the reaction by "diluting" the fissionable components with moderators, such as graphite.

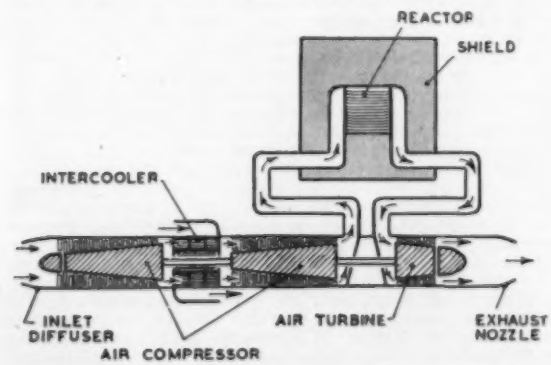
An atomic pile, then, is formed from fissionable material carefully positioned in a moderating matrix, and housed within a massive lead shield to permit personnel to approach the pile without being exposed to dangerous free radiation. Generally, the moderators are adjustable, often in the form of rods which can be slid in or pulled out of the pile. Thus, with all the rods fully in, the reaction can be kept at what might be termed "idling speed," while something approaching a bomb might result were all the rods suddenly to be withdrawn.

The next question that might be asked is "what does one get from an atomic pile?" Most of the piles in use in this country, at least, are really factories in which are produced fissionable material, such as plutonium, by transmutation from other elements in the same general uranium/lead family. At the same time, the level of radioactivity within the pile is such that specimens of substances placed in the pile for a sufficient time become radioactive themselves; Britain is the world's leading exporter of radioactive isotopes, and these valuable products have literally innumerable uses. The final characteristic of a pile is that it gets warm inside; in fact, if the moderating rods are pulled out far enough, it can get too hot for comfort, and the pile can melt and destroy itself.

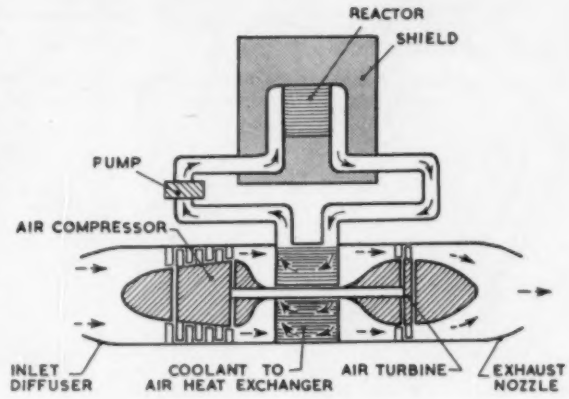
It is the production of heat which provides the key to the atomic power plant of the future, for heat and work are virtually synonymous. The pile, or reactor as it is generally termed when associated with the production of power, can thus be looked upon as a bulky and heavy box from which an almost inexhaustible supply of heat can be taken. Means must then be found for turning this supply of heat into propulsive thrust.

The aircraft designer's thoughts naturally turn to a "jet" form of power unit, and the simplest unit of all—at least, from the mechanical viewpoint—would seem to be the ramjet. All that should be required are a propulsive duct of suitable profile, containing a heat exchanger in place of the more usual combustion chamber. The writer feels that the performance of such a unit would be too limited—by pressure drop, Mach restriction and low heat-release rate—to be of any interest in the present state of the art.

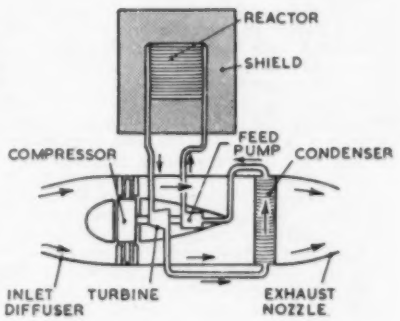
The designer is left with ducts containing mechanical compressors, and three such propulsive systems, all largely self-explanatory, are illustrated. Each is supplied with heat from a simple reactor, each is of turbojet form (although there is no apparent objection to a turboprop) and each has clear advantages and disadvantages.



The direct air cycle can be looked upon as a high-compression turbojet with a novel form of heat supply. It obviates the need for a liquid circuit.



The use of a liquid circuit (above) can greatly increase the power available from a given reactor.



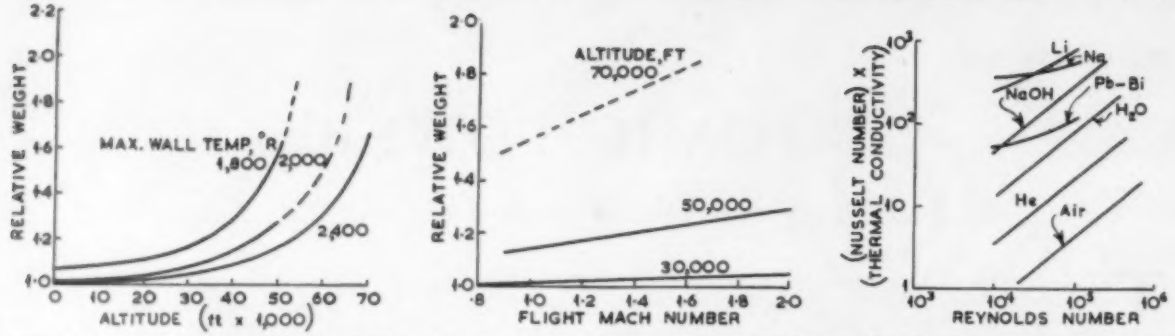
The high-pressure liquid system (right) supplies the turbine with superheated fluid, which flashes into steam and is then condensed.

In the first arrangement—the direct air cycle—there is only one flow of air. Taken in at a normal ram intake, it is compressed conventionally, passed through an intercooler, further compressed, and then heated by passage through the reactor itself. The geometry and mechanical details of the reactor could take several forms, but it might be that the cooling air could be passed along the uranium rods themselves, the latter being finned for greater area. The hot, compressed air is then expanded across the compressor-driving turbine and finally expelled to atmosphere as a propulsive jet. The very high compression, to an overall ratio of at least 15 : 1, is necessitated by the fact that air is a poor heat-transfer medium and, to obtain enough power from the reactor, the flow has to be compressed to the maximum possible density. In practice, such compression would almost certainly be carried out by two independent units, in "two-spool" manner.

Considerably higher powers can be transferred to the propulsive airflow if, instead of passing the flow itself through the reactor, an intermediate closed circuit filled with a suitable liquid is employed, so that the continuously circulating fluid can efficiently take heat from the reactor and pass it to the airstream. It is also certain that the air pressure drop would be much reduced, and quite an attractive power unit results.

Unfortunately, the selection of the optimum liquid is itself proving a laborious task, to say nothing of the problems involved in designing the circuit and choosing the right temperatures, pressures and materials. The problem can basically be resolved into the fact that a closed-loop piped circuit is required to be able to extract heat from a reactor at the maximum possible rate, and transfer it to a fast-moving airstream, with the minimum pressure drop to the air.

Other problems arise: the liquid is circulated at high pressure; the temperature, also, must be as high as possible—certainly at least at red heat—for acceptable efficiency; the liquid must not



Relative weight is shown by the left-hand and centre graphs to be heavily dependent on altitude and Mach number. The centre curves are drawn for a maximum wall temperature of 2,000 deg R (deg C x 5/4). The third figure shows specimen heat-transfer curves.

ATOMIC POWER . . .

deteriorate, neither must the piping; there must be no chemical reaction between the liquid and the pipe, at the temperatures and pressures involved; the piping must be able to resist thermal shock, and temperature variations over a wide range; the liquid and the piping in the reactor must have a low capture cross-section for neutrons, i.e. the number of free neutrons wastefully captured by the heat-transfer circuit must be a minimum; and, finally, the system must be so designed that hot-spots do not occur on the pipe walls, for erosion becomes excessive at such points.

There are many other problems, but there is a third basic system still to be considered, and it is likely to be at least as good as either of the other two. This is the high-pressure liquid cycle, in which the cooling fluid drives the turbine directly without the need for any heat exchanger. The arrangement can be looked at either as a turbojet in which the gas turbine is replaced by a high-pressure liquid/vapour turbine, or as an entirely new form of unit in which the liquid/vapour turbine drives an airscrew mounted within a duct. The advantages are many, and they include the fact that, for a given power, the turbine will be smaller than an equivalent gas turbine. The maintenance of a very high pressure throughout most of the circuit ensures that, in spite of the temperatures involved, the fluid remains in a liquid state, except, probably, for a short period as vapour just after passage through the turbine. This vapour is converted back to liquid in a condenser. In this instance, the reactor resembles a flash boiler in which the liquid is restrained, by extreme pressure, from vaporizing.

Present knowledge—certainly present published knowledge—of the behaviour of such systems is extremely limited. Bearing in mind the possible system pressure of 5,000 lb/sq in, and temperature of 1,000 deg F (these are acceptable *minima*), even the evergreen Callender's steam tables are hardly adequate. Much is being done in the investigation of heat-transfer and vapour pressure at these levels, in impressive test rigs full of fearsome-looking lengths of tubing glowing at cherry-red temperature. The work is complicated by the fact that most of the working fluids that appear to be most promising are, if not relatively new in themselves, at least entirely new materials from the thermodynamic viewpoint.

For example, liquid metals, molten salts and, particularly, eutectic alloys are all receiving attention. Some of the materials examined by the National Advisory Committee for Aeronautics, at the Lewis Flight Propulsion Laboratory in Cleveland, are shown in the diagram on this page dealing with heat-transfer characteristics. Air is obviously poor; water (H_2O in the diagram) is barely acceptable, but this familiar substance has good qualities as a moderator, and can also be made non-corrosive, and it may be that it will be usable when its behaviour at very high pressure has been fully explored.

Best of all from the heat-transfer viewpoint are the liquid metals, but the accepted rules for convective heat transfer cannot be applied, and some combinations are undesirable from the aspects of corrosion or inflammability. Lead-bismuth (Pb-Bi) is being exhaustively examined, and appears attractive on account of its low melting point, low capture cross-section and non-inflammability. Molten sodium hydroxide (NaOH) has also been used, in conjunction with an air-cooled heat exchanger.

Heat exchangers themselves are likely to be much like those in use at present, only more so—by which we mean that every current requirement is multiplied perhaps tenfold, in order to obtain the required light weight, small bulk, high permissible temperature and immense heat transfer. The N.A.C.A. are currently working on two main forms: the shell and tube, with the liquid metal as the shell fluid, and the finned tube, with the fluid inside the tube, both being of the counterflow type.

Reactor construction cannot yet be discussed, but it is abundantly clear that the big problem here is weight. Stationary piles are encased in literally hundreds of tons of lead and concrete, and even the fact that 0.05 lb of fissionable material (properly used) can propel a given aircraft as far as can 100,000 lb of hydrocarbon fuel burnt in turbojets is not going to permit shielding of this weight. Another point to be remembered is that a single, immensely weighty reactor mounted in the fuselage is going to produce wing bending moments very much more severe than are experienced at present, for current aircraft invariably have a distributed power unit and fuel weight.

Almost the only component which may be easier to design in the future is the propulsive unit itself. Here, operating stresses are likely to be reduced, in comparison with those now accepted in gas turbines, and temperatures are also likely to be slightly lower and more uniform.

The key to the possibilities of atomic power lies largely in the two graphs on this page dealing with the variation in relative weight with altitude and Mach number. Both show tremendous variation, and it is immediately apparent that, unless designers are prepared to take the bull by the horns and develop really fiercely hot systems, the atomic aircraft will never get above about 40,000ft altitude—a surprising result, when it is borne in mind that the source of power is completely independent of the atmosphere.

In the opinion of the N.A.C.A.'s Dr. Abe Silverstein, it would be highly desirable to aim at system temperatures even greater than the 2,000 deg R assumed for the curves of weight versus Mach number. He has a firm opinion, backed up by very extensive research, that the operating temperature is the overwhelmingly important factor which virtually dictates whether an atomic-powered aircraft will fly at all. But, he says, if it will fly at all its range will be "more than adequate."

Finally, something can be said about the type of aircraft most suited to atomic power and the effect of such propulsion on aircraft design. At present, several of the largest firms in the established American aircraft and engine industries have long been involved in this field, including Douglas, Boeing, Lockheed, Convair, North American, Pratt and Whitney and General Electric. We published a lengthy summary of a lecture by Dr. M. C. Leverett, of G.E.C., in our issue of March 21, 1952.

An airframe engineer, Mr. Hall L. Hibberd, vice-president of Lockheed, recently discussed atomic power in California, and he began by pointing out that, although his company had been studying the subject with the Air Force for over four years, they had been permitted only one 38-word security-cleared press release.

He stressed the fact that the greatest advantage of an atomic-powered aircraft lay in the fact that it would have not only great range and endurance but also great *high-speed* endurance. Initially, he suggested, atomic power would be applied to a supersonic global bomber—within 10 years; later, perhaps, there might be a case for it in civil transports. Yet there was not the same clear-cut case for an atomic-powered aircraft as there was for a similarly-powered submarine.

The atomic-powered aircraft would not, he suggested, look greatly different from similar conventionally propelled machines, neither would the noise be distinctive. One possible advantage from the military point of view was that there would be no smoke (or, we suggest, vapour) trail; for a given all-up weight, the atomic machine might be rather smaller than its chemically propelled contemporary—and the all-up weights would probably be comparable—and the only real structural differences might be the atomic aircraft's lack of tank-access doors.

Regarding radiation shielding, Mr. Hibberd said that the "unit shield"—the type generally used for ground piles, completely surrounding the reactor—was not necessarily the best for an aircraft. The "divided shield," in which shielding was split into portions, some being placed around the reactor and some around the flight station, could form a less-weighty compromise, particularly if the crew were concentrated into a small space.

So far, no official indication has been given of any direct work on an atomic-powered aircraft in this country, but it would be remarkable if the Ministry of Supply did not have a study group on the problem; furthermore, it is possible that initial research contracts may have been let out to the industry and/or seats of learning, but it is doubtful if the total effort is anything like comparable with that now being made in America. W.T.G.

PART I

A "Flight" photograph of the original 504, showing the square engine cowling and the warping, inverse-tapered, strut-connected ailerons.

THE AVRO 504

Historic Military Aircraft No. 8

By J. M. BRUCE, M.A.

ALTHOUGH it performed few resounding feats of arms, the Avro 504 in its great variety of forms is assured of a place of honour in our aircraft history. Whether it is remembered as a delightful trainer of the war period or as a friendly aeroplane popping into and out of improbable fields as a joy-riding machine in the inter-war years, its immortality is secure. Above all, it was the aircraft which helped to lay the foundations of decades of safe and logical flying instruction.

Recalling the birth of the Avro 504 Sir Alliott Verdon-Roe writes:—

"I still have my original rough pencil sketch on ¼in squared paper which started this aeroplane. There is a considerable amount of minute written matter on the drawing. When I designed this aeroplane I thought that we would be fortunate if we received an order for half-a-dozen.

"I was very particular about the detail design, which was on unit construction lines for easy assembling, rather a new idea then. I kept paper and pencil by my bedside (and still do) to sketch and write ideas before forgetting them. While travelling in trains then most of the time was spent scheming the detail design. It was a job which fascinated me. Every detail was given most careful thought before being entrusted to the draughtsmen.

"Reduction of weight, ease of manufacture, simplification of parts, were among my aims and I felt that the machine would have good flying qualities. The wing section was pure guess work. I produced a much lighter engine plate than the original, and equally strong, but the authorities would not allow its adoption."

Construction of the first Avro 504 was begun in April, 1913, and its first tests were carried out at Brooklands in July. The 504 made its debut at Hendon on September 20th of that year as an entrant in the second Aerial Derby.

The Avro 504 was more closely related to the Avro Type E of 1912 than to any other preceding Avro type. The Type E was given the Avro type number 500, and was a two-seat two-bay biplane powered by the 50 h.p. Gnôme rotary engine: a single-seat version also existed. The type was ordered for the then newly-formed Royal Flying Corps.

The Avro 500 had unstaggered wings and a central skid undercarriage in which the wheels were mounted at the ends of a transverse leaf spring. Lateral control was by wing-warping on most machines, but at least one Avro 500 was fitted with ailerons of inverse taper. The rudder also underwent modification.

When the prototype Avro 504 first appeared, it had the 80 h.p. Gnôme engine installed in a nose-bearing mounting and within a cowling of square cross-section; the cowling had an arched top and bulged sides. The fuselage was a typical wire-braced wooden box-girder with the upper longerons quite straight in side elevation. The fuselage terminated in a vertical stern-post to which was hinged a comma-shaped rudder; there was no fin, and the tail-skid was attached directly to the bottom of the rudder. The main undercarriage was an original variation on the wheels-and-skid theme. There was a long central skid, and each main undercarriage leg carried its own shock absorber encased in a fairing. Each shock absorber consisted of 8ft 8in of rubber cord in tension.

The two-bay wings were of equal span and had a pronounced stagger. Each wing panel had only five fully formed ribs, which also served as compression members. Light spanwise stringers were let into these ribs, and the remaining contour-forming ribs consisted of strips of wood which were fastened to the leading edge, spars, stringers, and trailing edge. Lateral control was obtained by the curious device of warping ailerons. Although separate surfaces, these ailerons were secured at their inboard ends; they were inversely tapered, and their broad outer ends were warped by means of cables. Upper and lower ailerons were connected by a strut.

It was at once obvious that, with the possible exception of the warping ailerons, the Avro 504 was a thoroughly workmanlike aeroplane and considerably in advance of most of its contemporaries in design, construction and performance.

Much of the early flying of the 504 was done by the late F. P. Raynham. Flown by him, the machine was placed fourth in the second Aerial Derby at an average speed of 66.5 m.p.h.

Another contest in which the prototype 504 took part, again flown by Raynham, was the so-called "War of the Roses" contest flown off on October 2nd, 1913. In this, the Avro firm had accepted a challenge to a cross-country race against Dr. Christie's new Blackburn monoplane, flown by Harold Blackburn. A trophy was provided by the *Yorkshire Evening News*, and the course was Leeds, York, Doncaster, Sheffield, Barnsley, Leeds, a total distance of 100 miles. Visibility was very bad, and Raynham, who was over completely strange territory, had to abandon the race when near Barnsley.

The 504 underwent certain modifications early in its career. The engine was given a new nose-bearing support made of bent steel tubing, over which was fitted a new cowling of rather bulbous appearance but better streamline form. Lateral control with the warping ailerons was not particularly effective, so freely-hinged conventional ailerons of constant chord were substituted.

On November 24th, 1913, Raynham flew the machine to Farnborough for it to undergo official tests. Over a measured course the Avro clocked a speed of 80.9 m.p.h. and climbed to 1,000ft in 1 min 45 secs; the stalling speed was 43 m.p.h. The tests were carried out with a passenger and three hours' fuel on board.

These performance figures made a deep impression at the time, but their impact was somewhat lessened when, only five days later,

THE AVRO 504 . . .

the Sopwith Tabloid put up an even better performance in the same tests.

Raynham made several outstanding flights on the Avro 504. On February 4th, 1914, he flew the machine to a height of 15,000ft, thereby comfortably exceeding the existing British altitude record of 13,140ft which had been set up by Captain J. M. Salmond on a B.E.2. Raynham had taken off from Brooklands, and from his machine's ceiling he glided to Hendon, about twenty miles away, with his engine off. After gliding for 25 minutes he was over Hendon at 5,000ft, so he spiralled down and landed there without using his engine.

The flight was a magnificent exhibition of airmanship, but the climb could not count as a record because it was not officially observed. Six days later Raynham made a formal attempt on the altitude record, and, with Mr. MacGeagh Hurst as passenger, took the Avro to 14,420ft.

Soon after these flights, the Avro 504 was bought by the *Daily Mail* and toured the country giving exhibition flights. The Avro's new owners required it to be flown from the sea at coast resorts; the manufacturers therefore made and provided a float undercarriage which was interchangeable with the normal wheels. A floatplane version was exhibited at Olympia in March 1914, during the fifth Aero Show.

A change of power-plant was also made at this time. It was thought that the original 80 h.p. Gnôme, with its actual output of little more than 62 h.p., might not provide sufficient power for the heavier seaplane version; and it was replaced by an 80 h.p. Gnôme Monosoupape seven-cylinder rotary engine, which was supposed to be more powerful than the ordinary Gnôme of the same nominal power. The choice was an unfortunate one, for the new engine proved to be far from satisfactory and gave a great deal of trouble. It finally brought about the destruction of the Avro 504.

During the *Daily Mail* tour the Avro was flown by F. P. Raynham and George Lusted, and its first flight as a seaplane was made at Paignton in April 1914. In August it was at Shoreham, on floats. It was commandeered as soon as war was declared on the 4th of that month, but was destroyed two days later: the engine failed as Raynham took off to deliver the machine to the Services, and he had insufficient height to avoid crashing on land.

In the early summer of 1914 the War Office had ordered twelve Avro 504s and the Admiralty one. In the construction of these machines there arose a remarkable example of lack of co-operation between the War Office and the Admiralty. Before acceptance of the type for Service purposes the design of the airframe had been studied by both Departments. The War Office accepted the structure in its designed form, but the Admiralty requested that spars of slightly greater cross section be fitted. Avros, looking ahead to further orders, naturally wished to avoid the production complications which the use of different spars would mean, and asked the War Office to adopt the size of spar specified by the Admiralty. This the War Office declined to do. Consequently all the Admiralty Avro 504 variants had slightly larger spars than the machines which were built for the R.F.C., an anomaly which persisted until the amalgamation of the R.F.C. and R.N.A.S. in 1918, by which time spars of the original dimensions had been standardised in the 504K. All the production Avro 504s had one feature in common: the rear fuselage was modified to be symmetrical in side elevation, so that the upper longerons sloped downwards behind the rear cockpit.

In the R.N.A.S., the Avro was frequently referred to as the Avro 179, a designation obtained by using the serial number of the first machine accepted by the Admiralty. Inevitably, the use of this designation has led to some confusion.

Some of the R.F.C. Avros were delivered before the outbreak of war and the remainder were handed over soon afterwards. When No. 5 Squadron went to France on August 13th, 1914, its equipment included a few Avro 504s; but the type was never used in large numbers by front-line units. In fact, the greatest known number of Avros on the strength of the R.F.C. Squadrons in France is only thirteen: on March 10th, 1915, No. 1 Squadron had eight, No. 3 had one, and No. 5 had four. Six months later the R.F.C. had seven in France, four with No. 1 Squadron and three with No. 5.

Service use in the field showed that the Avro 504's flight endurance was too short, and later production aircraft had increased tankage which brought the endurance up to 4½ hours.

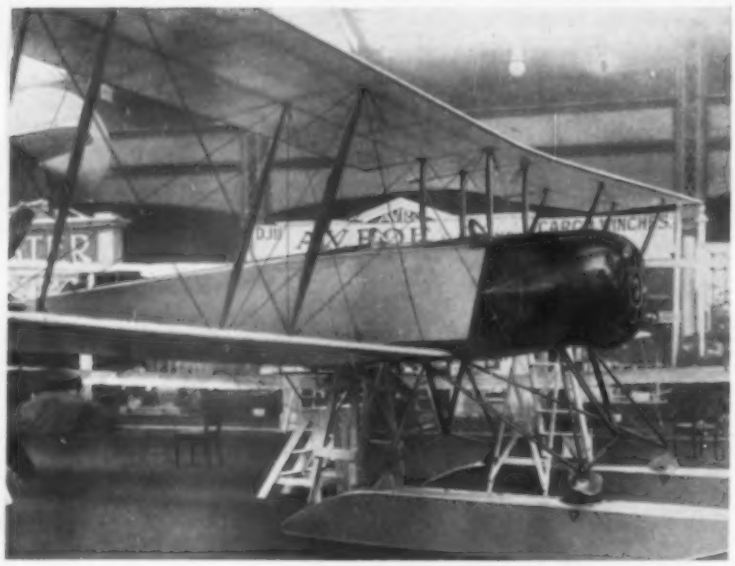
One of the Avros of No. 5 Squadron was the first British aeroplane to be brought down by the enemy. On August 22nd, 1914, the machine flown by Lt. V. Waterfall (observer, Lt. C. G. C. Bayly) was shot down by infantry fire in Belgium, and it has been surmised that this Avro may have provided the Germans with the first positive evidence that British forces were in the field against them.

Commander Samson's Eastchurch Squadron of the R.N.A.S. received its first Avro 504 on November 27th, 1914. This machine set out to bomb the submarine depot at Bruges on December 14th with four 16-lb bombs, but Flt. Sub-Lt. R. H. Collet, its pilot, could not find Bruges in bad visibility, and bombed the Ostend-Bruges railway line instead.

In common with its contemporaries, the Avro 504 had not been designed to carry any kind of offensive armament, and it was flown from the rear seat. The observer sat directly under the centre-section and had a centre-section strut at each corner of his cockpit. The chances of operating a machine-gun satisfactorily from that position were remote indeed. Nevertheless, various attempts were made in the field to provide some kind of useful armament.

One of the earliest of these attempts was made on Avro 504 No. 383 in mid-October 1914. The Avro had been delivered to No. 5 Squadron on October 15th, and within a few days it had been fitted with a Lewis gun by its pilot, 2nd Lt. L. A. Strange, who was assisted by Capt. L. da C. Penn-Gaskell. The "gun-mounting" would probably have delighted Mr. Heath Robinson, and is best described in Wing Commander Strange's own words (in his book *Recollections of an Airman*):

> "The mounting consisted of a metal tube, which I carefully selected from the tail boom of a wrecked Henri Farman. The gun lay on the top of the fuselage decking, while a piece of rope, lashed around its



Reading down: the 504 prototype after modification, showing the freely-hinged, constant-chord ailerons, and modified cowling; the 504 prototype floatplane at Olympia in 1914; and the 504 production version, showing the downward slope of the upper longerons towards the tail.

Worth Defending

FREEDOM FROM WANT

Freedom from Want can never apply to a dominated people. History records that any economy built at the price of freedom has always resulted in lowered standards of living . . . and Want is still today the brand on helpless millions.

Freedom from Want is the right of all free people — the goal of every democratic nation. Freedom from Want . . . is *worth defending!*

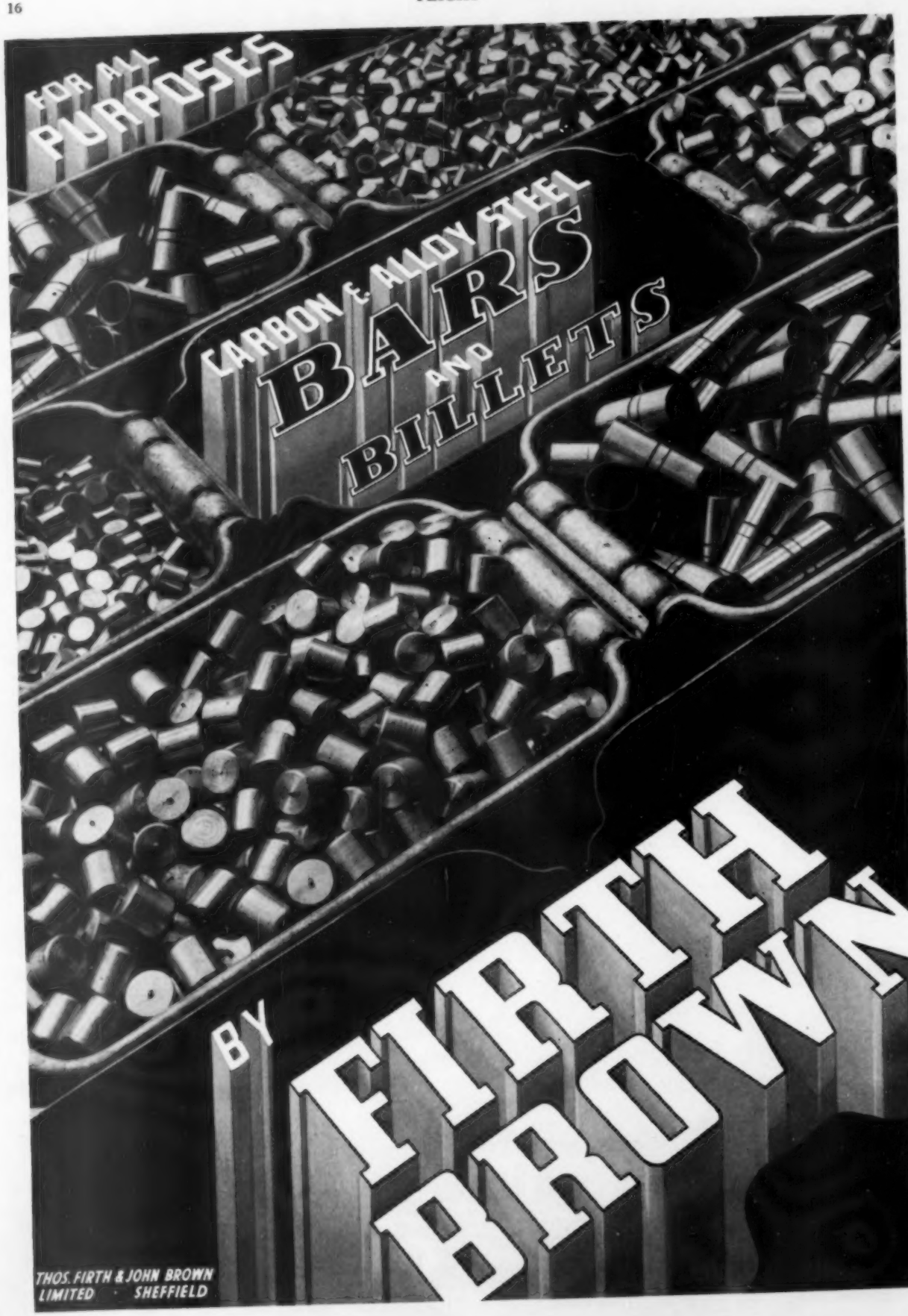
C-L CANADAIR LIMITED

CANADAIR

— AIRCRAFT MANUFACTURERS —

LIMITED, MONTREAL, CANADA

One of a series dedicated to the survival of freedom — Reprints on request. — European Representative, J. H. Davis, Princes House, 190 Piccadilly, London, W.1., England.


FOR ALL PURPOSES
CARBON & ALLOY STEEL
BARS
AND
BILLETS
BY
FIRTH BROWN
THOS. FIRTH & JOHN BROWN LIMITED SHEFFIELD

(Top) Avro 504A—one of 50 such machines built by Bleriot and Spad. Beneath, Avro 504B—one of 10 built by A.V. Roe.

THE AVRO 504 . . .

centre of balance, was passed up over the metal tube and fixed to the cross member of the front seat tank bearer, for it must be remembered that in those days the front seat was on top of the petrol tank. A pulley on the rope enabled the observer to sling the gun up into mid-air and fire it all round as well as back over the pilot's head, with the aid of a stock from the shoulder."

On October 22nd, 1914, Strange and Penn-Gaskell carried out what was probably the first ground-strafing attack of the war, when they brought the Avro's Lewis gun into action against a train and enemy troops at Perenchies siding. Exactly one month later Lt. Strange, with Lt. F. G. Small as his observer, forced down an Albatros two-seater near Neuve-Eglise.

Military actions in which the Avro 504 took part were few, but the most audacious and brilliant by far was the R.N.A.S. raid on the Zeppelin sheds at Friedrichshafen, Lake Constance.

While Strange and Penn-Gaskell were strafing Perenchies in No. 383, Lt. Noel Pemberton Billing of the R.N.V.R. was on his way to Belfort to prepare for the attack: he arrived there on October 24th, 1914. When his preparations were complete he returned to England on October 28th to collect the aeroplanes and pilots for the execution of the raid.

A special flight of four Avro 504s had been formed at Manchester under Sqn. Cdr. P. Shepherd, and the pilots were Sqn. Cdr. E. F. Briggs, Flt. Cdr. J. T. Babington, Flt. Lt. S. V. Sippe and Flt. Sub-Lt. R. P. Cannon. The Avros, officers and eleven air mechanics arrived at Belfort by night on November 13th, 1914. Soon after their arrival Sqn. Cdr. Shepherd was taken ill; the weather was bad, and a strong easterly wind delayed the attack for a week.

On Saturday, November 21st, the weather improved sufficiently for the raid to take place, and the Avros were brought out for engine and bomb-rack tests. The aeroplanes were brand-new: they were, in fact, the first four Avros to be delivered to the Admiralty, and were numbered 179, 873, 874 and 875. Their 80 h.p. Gnôme engines were not new, however, which was probably why no test flights had been made with the aircraft; the raid itself was their first flight. There was at that time no such thing as a standard bomb-rack, and the Avro company designed and made the racks for the four machines. Mr. A. V. (now Sir Alliott Verdon) Roe said they were "a Heath Robinson job," but they served well enough in the event. Stowage was provided for four 20-lb high explosive bombs and four incendiaries, but for the raid each aircraft carried only four 20-lb bombs.

The Avros left Belfort at five-minute intervals. Sqn. Cdr. Briggs was first to go on No. 873, followed by Babington on 875 and Sippe on 874: Cannon's machine broke its tail-skid and was unable to take off. Over the target Sippe's fourth bomb refused to leave the rack, but two of the eleven which dropped in the target area did all that was necessary. These fell on the airship sheds. One damaged a Zeppelin which was inside; the other destroyed the gas-works, which exploded and did great damage. The raiders did not escape unscathed, for Briggs was shot down and nearly lynched after crashing. No. 875 was later on the strength of No. 1 Squadron, R.N.A.S., but did not return from a raid on enemy positions on February 16th, 1915: its pilot on that occasion was Flt. Lt. E. G. Rigall.

The Avro 504 was less successful against the Zeppelin in its own element. The L.Z.38 was intercepted by Flt. Sub-Lt. Mulock of Westgate R.N.A.S. Station about 3.30 a.m. on May 17th, 1915, but the airship climbed away too rapidly to allow Mulock to attack with his Avro's load of two grenades and two incendiary bombs.

That same night, soon after Mulock's adventure, Flt. Cdr. A. W. Bigsworth, in another Avro, was pursuing the L.Z.39 towards Ostend. At 10,000ft over the town he was 200ft above the airship, and he dropped his four 20-lb bombs on it. Smoke issued from the Zeppelin's stern, but it was not destroyed. Ultimately, and in a damaged condition, it made a rough landing at Evère.

With the standardization of the B.E.2C the Avro ceased to be a front-line aircraft with the R.F.C., but continued in limited service with the R.N.A.S. In point of fact, the Avro company were at one time told that they would have to stop making 504s, which were regarded as obsolete, and undertake the manufacture of B.E.2Cs: production of the Avros might continue until instructions for the building of the B.E.s were issued. Fortunately, those instructions were never forthcoming.

The basic design was modified in detail as time went on, and each successive variant was identified by the addition of a suffix letter to the Avro's type number. The 504A retained the 80 h.p. Gnôme engine, but had ailerons of reduced span and interplane struts of broader chord. On some 504As the lower wing-roots were uncovered for about 12 inches on either side in order to improve the downward view. The tailskid remained attached to the bottom of the rudder. The first true 504As were the fifty machines numbered 2890-2939, but the designation is sometimes loosely applied to the 63 production 504s which had preceded them. The 504A was built in considerable numbers.

As part of the natural sequence of events, the Avro was relegated to training duties after its withdrawal from active service. Dual control had to be installed, and Avro's designed a neat dual control unit comprising seats, bearers, control columns, rudder bars and heel rests. This unit could be assembled separately and inserted complete into the fuselage. Trainer versions of the Avro 504 design were issued to training units from 1915 onwards.

The next sub-type, the Avro 504B, was an R.N.A.S. version. It set a new fashion, followed in all subsequent R.N.A.S. Avro 504 variants, by having a plain rudder attached to a large low aspect-ratio fin. The 504B reverted to the long ailerons, which also remained standard on R.N.A.S. Avros, and there were quadrantal cutouts at the trailing edge of the lower wing-roots. On the first 504Bs the sides of the rear cockpit were cut a little below the level of the upper longerons; but on later machines the upper longerons were unbroken, and the rear cockpit was surmounted by a circular frame on which a Scarff ring-mounting could be installed when required.

The Avro 504B was the first variant to have a pylon-type tailskid similar to that of the B.E.2C, a fitting which remained standard on all subsequent 504 sub-types. Some 504Bs were used operationally from Dunkirk, but the type was more widely used by the R.N.A.S. as a trainer. Thanks to its larger fin it was much more difficult to spin than the R.F.C. versions. The standard power-plant was the 80 h.p. Gnôme, but when supplies of that engine ran short some 504Bs were fitted with the 80 h.p Le Rhône.

The endurance of the Avro, even when increased to 4½ hours, was still considered to be insufficient for long-distance reconnaissance flights or anti-Zeppelin patrols. A single-seat version with greater fuel capacity was therefore ordered. This was designated 504C, and had a large cylindrical tank installed in the position normally occupied by the front cockpit: the endurance was no less than eight hours. The 504C was an R.N.A.S. variant, and the airframe was virtually identical to that of the 504B. The cockpit corresponded to the rear cockpit of the 504B, and its sides were similarly cut below the level of the upper longerons. The 504C had the R.N.A.S. wings with long ailerons, and the large fin and plain rudder were fitted. The engine was still the 80 h.p. Gnôme.

For anti-Zeppelin duties some Avro 504Cs had an aperture in the centre-section through which a Lewis gun fired upwards at an angle of about 45 degrees.

A similar single-seat conversion for the R.F.C. was designated 504D, and probably bore the same relationship to the 504A as the 504C did to the 504B. It is doubtful whether the 504D was produced in quantity, whereas an appreciable number of

THE AVRO 504 . . .

504Cs (at least 80) were built. Again the engine was the 80 h.p. Gnôme.

It was felt that the Avro was somewhat underpowered with the 80 h.p. Gnôme, and A. V. Roe & Co. were asked to fit other types of engine to improve the performance. The 100 h.p. Gnôme Monosoupape was fitted to a new 504 variant for the R.N.A.S. which differed considerably from all other war-time sub-types of the Avro 504: this version was designated 504E. It had a new fuel system with pressure feed from the main tank, which was installed behind the front seat; the rear cockpit was moved one bay further aft. The change in the position of the C.G. was taken care of by reducing the stagger from the standard value of 24in to about 9in. The front centre-section struts were attached to the upper longerons at the normal points, but the attachment points for the rear struts were moved one bay further aft. Thus the centre-section struts converged upwards in side elevation.

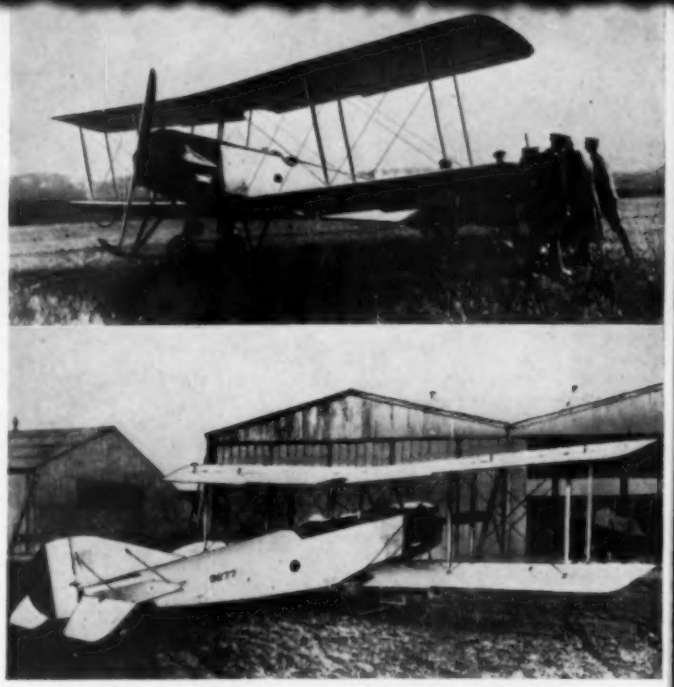
Externally, the engine installation of the Avro 504E looked no different from that used on its predecessors, but in fact the steel tube "spider" which carried the nose bearing was altered to accommodate the larger engine. In construction the fuselage of the 504E recalled that of the prototype Avro 504, for the upper longerons were quite straight when seen in side elevation. The R.N.A.S.-pattern wings, ailerons and tail unit were fitted. Only ten Avro 504Es were built; some were used for training purposes at Chingford and Fairlop, and one went to Cranwell.

At the suggestion of the Admiralty, an installation of the six-cylinder Rolls-Royce Hawk in-line engine was made in 1916. This engine had a nominal output of 75 h.p., and was widely used to power the various S.S. types of non-rigid airships. The Avro in which the Hawk was installed was No. 8603, the last machine of a batch of thirty Avro-built 504Cs; and the designation 504F was given to the modified aircraft. Although it was said to be very pleasant to fly, the 504F was still underpowered and no production was undertaken; but there are indications that a second machine may have been fitted with a Hawk engine. A contract for 30 machines placed by the Admiralty with a firm of contractors was cancelled and replaced by one for the standard 80 h.p. Gnôme Avro.

At about this time an attempt was made to produce a two-seat fighter version, and an Avro two-seater appeared, powered by the 150 h.p. Sunbeam Nubian. The aircraft appeared to have standard 504 wings with normal stagger, and the fuselage resembled that of the 504E but had the cockpits well aft. A ring-mounting for a Lewis gun was fitted to the rear cockpit, and the Naval type fin and rudder were fitted.

This machine was so much modified that it was given the new designation Avro 519. The rate of climb was poor; the pilot's forward view was blocked by the radiator, which was installed under the centre-section; and neither the War Office nor the Admiralty would believe that the Avro 519 was strong enough for such a powerful engine. Consequently the type was not developed.

Almost contemporary with the 519 was the Avro 521, another attempt to produce a two-seat fighter. Powered by a Clerget rotary engine, the Avro 521 bore a family resemblance to the 504 series but was quite a different aircraft. It had single-bay wings and a vee undercarriage. Twenty-six Avro 521s were built for the R.F.C., but the type was not particularly pleasant to fly and was never used operationally.



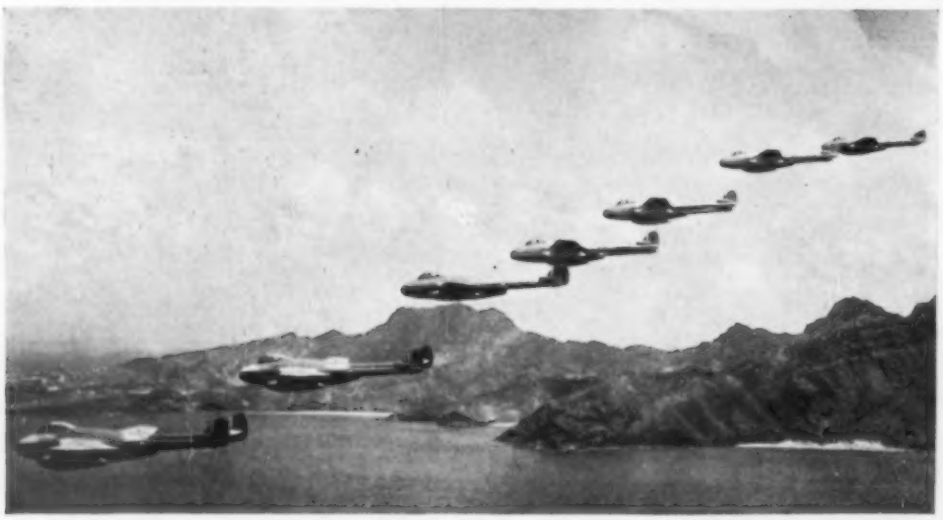
(Top) Avro 504C, showing the placing of the single cockpit. Beneath Avro 504E, showing the greater distance between the cockpits, modified centre-section, reduced stagger, R.N.A.S. fin and rudder, long ailerons and quadrantal cut-outs in the lower wing roots.

The Avro 504G was a conversion of the 504B and was used by the R.N.A.S. as a gunnery trainer. A Scarff ring-mounting was fitted to the rear cockpit, and a fixed synchronized Vickers gun was fitted for the pilot's use. The engine was the 80 h.p. Gnôme.

In the article dealing with the Sopwith Pup (*Flight*, January 1st, 1954), mention was made of the aircraft catapult built by Waygood-Otis to the designs of Mr. R. F. Carey. The first aeroplane to be launched from this catapult was a specially modified Avro 504C, which was suitably strengthened, provided with catapult pick-up points, and fitted with a special padded seat with neck support for the pilot. The modified machine was redesignated 504H. The modifications were made under the supervision of Sqn. Cdr. E. H. Dunning, that great pioneer of deck-flying. Unhappily, before the tests of the catapult and the Avro 504H could be conducted, Dunning was killed on August 7, 1917 in his third attempt to land a Sopwith Pup on the forward deck of *H.M.S. Furious*. Flt. Cdr. R. E. Penny volunteered to be catapulted in the Avro 504H. The launch was made successfully, and Penny landed safely.

(To be concluded)

Putting "Protect" in Protectorate: Aden-based Vampire Fighter-bombers



De Havilland Vampire F.B.9s of the Middle East Air Force work-out near Aden. When "Flight" visited the Protectorate last year it was reported that an Aden-based unit of this sort had a range for guns and rockets at Khormaksar beach, a bombing range inland, and that it did its normal annual training in Nicosia, Cyprus.

INSTRUMENT-PANEL DEVELOPMENTS

U.S. Navy Evaluates a New Presentation System

A PROGRAMME is being conducted by the U.S. Navy's Bureau of Aeronautics to develop a simplified instrument panel layout for jet fighters. The programme is reportedly directed towards avoiding some of the $50,000 and 18 months at present required to bring each all-weather pilot up to the necessary instrument-flying standard.

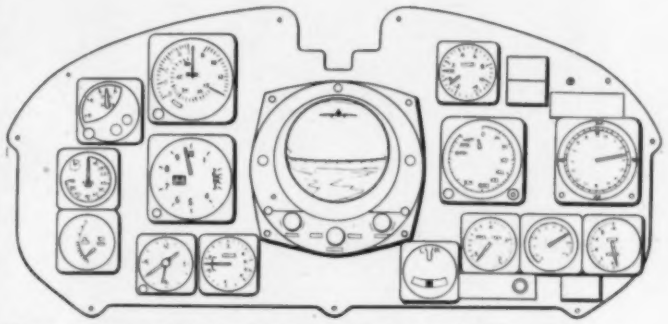
Many British pilots will already be aware of the American "scatter" technique of instrument arrangement. The new developments do not appear to be aimed at achieving a standard layout such as that of the R.A.F., but rather, by developing the instruments themselves, at simplifying and "naturalizing" presentation. Efforts are therefore being made to combine several readings in one dial, and to concentrate heading, attitude and radio-guidance information on one large, central pictorial screen.

The first results of the programme are the installation and assessment of an experimental simplified panel in a Grumman F9F-6 Cougar. The number of instruments has been considerably reduced, and the information most required in blind flying —heading and attitude—arranged on a large central dial. Around this, the remaining instruments have been distributed in an arrangement which still recalls the "scatter" technique. Nevertheless, airspeed and Mach indications both appear on one dial, and a single new instrument gives V.O.R. bearing and D.M.E. distance reading. The altimeter is also changed; instead of three pointers (tens of thousands, thousands and hundreds of feet) a Veeder-type counter shows thousands of feet in a window in the dial, and a single rotating pointer shows hundreds of feet. The second window is, as usual, for barometric pressure settings.

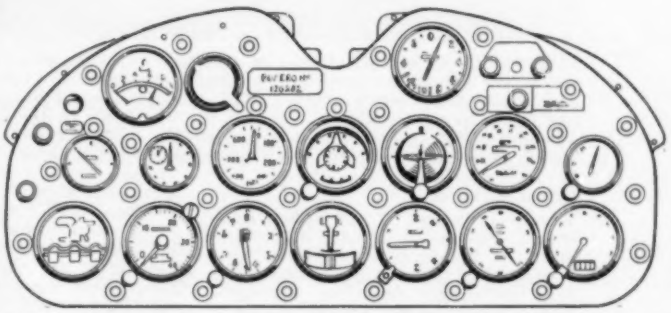
The most radical innovation is that both attitude and heading presentation are grouped on the large central screen. Ground and sky are pictorially presented on the rotatable cylinder, in front of which the usual small aircraft moves up and down and rotates. Thus, the little model "performs" against a realistic background although its movement in relation to the horizon is in the reverse sense to that of the normal artificial horizon. This pictorial background cylinder is marked at the horizon with compass bearings similar to those of a Gyro D.I. When the pilot turns to port, therefore, the little aircraft banks and the painted cylinder rotates giving the pilot what the American "human engineers" call a sensation of "mass motion" similar to that gained in visual flight.

This central instrument is operated by remote attitude and directional gyros. It is intended eventually to add to this section I.L.S.-type instructions and indications of deviation from pre-set altitude. The instrument obviously has great advantages, although mechanical and electronic snags might well prove difficult to recognize and impossible to remedy in flight.

In addition, the U.S. Navy Bureau of Aeronautics claims finally to have solved the problem of instrument lighting. The normal American system is for each instrument to have a separate light shining on it from a "beetle-brow" on its top rim. BuAer has developed a system of integral instrument lighting which, on the new F9F-6 panel, is as yet only installed in the central attitude-heading screen. The Bureau is also studying miniaturization of the less important instruments, such as the V.S.I. and turn-and-slip (the diameters of these two instruments have been reduced from 3¼in to 2in). The work is still continuing and may well produce some noteworthy results.



The experimental F9F-6 Cougar instrument panel. Anti-clockwise, round the heading/attitude dial, are combined Machmeter-A.S.I., veeder altimeter, V.S.I., turn and slip, fuel gauge and G-meter.



The present standard arrangement with six flying instruments centrally ranged and G-meter at top right.

A NEW INFRA-RED SPECTROMETER

DETAILS were given in London on Thursday, July 1st, of a new infra-red spectrometer produced by Mervyn Instruments, of Woking, in collaboration with the National Physical Laboratory. The main advantages of the new instrument are its wide applications in both research and industrial production, and its comparatively low cost.

The low cost has been made possible primarily by the work of Sir Thomas Merton, which enabled the N.P.L. to develop a method of producing defraction gratings much more cheaply than had previously been possible. Describing the application of this work to the development of the new spectrometer, Sir Edward Bullard, Director of the N.P.L., stated that the spectrometer used a monochromator developed by the laboratory which had a resolving power comparable with that of prism-type instruments, but achieved with unfigured optics and simple slits. The electronic side of the instrument, which contained much novel circuitry, had been developed by Mervyn Instruments, and gave an overall stability which had not previously been achieved by a single-beam instrument.

The two major applications of the new instrument are in the analysis of chemical compounds for research purposes and (with the grating locked at a pre-determined setting) for process control. The normal scanning range is from 2.8μ to 3.8μ; it is intended that a series of these instruments will be produced, each operating in one specific region of the infra-red spectrum.

U.S. NAVY'S NEW TRAINER

THE United States Navy announces the selection of the Beechcraft T-34 Mentor as its standard primary trainer. A basically similar aircraft—the T-34A—is now in production for the U.S. Air Force, and other machines of the same type are being supplied to the military air services of Chile, Colombia, El Salvador and the National Safety Forces of Japan. A licence has been arranged by Beech with the Fuji Heavy Industries of Japan to build T-34s for the National Safety Forces, and another licence has been negotiated with the Canadian Car and Foundry Company, of Montreal, to construct T-34s for the R.C.A.F.

SYDENHAM'S NEW RUNWAY

THE new 2,000 yd main runway at Sydenham Airport, Belfast —work on which began some twelve months ago—has recently been completed. The work has been financed jointly by Short Bros. and Harland, Ltd., and the Admiralty. Constructed on reclaimed land on the edge of Belfast Lough, the runway is 200ft wide and is designed for aircraft up to Comet weight (120,000 lb).

Construction has been carried out—under the direction of Mr. L. R. Greenway and Mr. J. Callagin, Admiralty civil engineers—by 200 local men, plus a few key personnel from England. The first 1,200 yd of the runway is slabbed with eight-inch-thick concrete: owing to a 30ft layer of mud under part of the site, the last 800 yd were surfaced with asphalt, which can be readily maintained should there be any sign of depression.

AIRCRAFT INTELLIGENCE

RECONNAISSANCE BOMBER: Coming-out portrait of the Douglas RB-66A, which flew for the first time on June 28th and was delivered on the same occasion from Long Beach to Edwards Air Force Base. Though closely related to the U.S. Navy's A3D Skywarrior, the RB-66A differs more from that type than is generally supposed. The span, for instance, is greater and the distinctive wing plan-form was shown in a drawing in our special military aircraft issue of June 25th. The podded power units are Pratt and Whitney J57s, although Allison J71s are also specified.

Great Britain

Vickers Transport. A new Vickers four-engined transport, designed to the requirements of British European Airways, is described in America as having 3,000/4,000 h.p. Rolls-Royce axial-flow twin-spool turboprops, designated RB109.

United States

Douglas A4D Skyhawk. Ed Heinemann, chief engineer of Douglas' El Segundo division, is reported to have said that Douglas engineers were tempted to delete the horizontal tail surfaces of this single-seater attack aircraft for the U.S. Navy, but decided after all "that it might not be good policy to experiment." The A4D is said to be faster than the Mig-15 and its small dimensions are claimed to reduce its vulnerability to gunfire and radar interception. Dual systems are eliminated. "When you rely on a duplicate system, all too often it does not work," avers Mr. Heinemann, adding: "We have concentrated on quality and in making sure the systems we have are dependable." He went on to say that he believes the A4D to be a major step in aircraft design on "a completely functional basis," making each requirement "stand on its own feet rather than by doing things because they have been done that way in the past." Douglas claim, incidentally, to have had less trouble with the J65 turbojet (Armstrong Siddeley Sapphire licence) on the first run-ups than with any other turbojet to date.

Douglas F4D Skyray. The first production model of the Douglas F4D Skyray (Pratt and Whitney J57 turbojet, with reheat) has exceeded the speed of sound in level flight on its maiden delivery flight to the U.S. Navy. The pilot, Bob Rahn, said that, having turned on the afterburner for take-off, he was airborne in 1,000ft, and had attained a speed of 450 m.p.h. as he crossed the boundary of Douglas's El Segundo airfield. He continued in a steep climb, cut the afterburner at 6,000ft, levelled out at high altitude and attained supersonic speed. He landed at Edwards Air Force Base, Muroc, shortly afterwards.

Lockheed T-33B. This designation has now been applied to the Lockheed experimental private-venture jet trainer with raised rear cockpit and other refinements as compared with earlier T-33s. The Allison J33-A-16A, of 6,350 lb maximum thrust, gives a maximum sea-level speed of about 590 m.p.h. and maximum rate of climb is 7,700 ft/min.

U.S.A.F. Bombers. Ceremonies at Barksdale Air Force Base, Louisiana, on July 31st will mark the retirement of Boeing B-29 and B-50 piston-engined bombers from Strategic Air Command of the U.S.A.F. Thereafter the Command will be completely equipped with Boeing B-47s, Convair B-36s and Republic F-84s.

France

Dassault Developments. Possibly the busiest firm in the French industry, Marcel Dassault now have the second prototype Mystère IVB (re-heat Rolls-Royce Avon) well into flight trials. The first prototype Mystère IVN two-seat night fighter is also completed and is expected to fly very shortly. Other flight trials continue with an Ouragan experimentally fitted with a bicycle landing gear (in France, a *diabolo*).

NORTH AMERICAN FJ-3 FURY
(Wright J65 Sapphire)

Span	37ft 1in
Length	37ft 5in

Featuring

operational diversity...

The Fairey 'Gannet' is equipped for a remarkable variety of duties and is in the widest sense a multi-role aircraft. Its design provides for every type of anti-submarine duty, whether the changing pattern of attack calls for extreme range or extra-heavy warload, for speed in pinning down a target or extended endurance for patrol. Compact design and twin-engined performance enable the 'Gannet' to counter most effectively the underwater challenge to our sea communications.

FAIREY

Powered by an Armstrong Siddeley "Double Mamba" Engine

GANNET

THE FAIREY AVIATION COMPANY LIMITED · HAYES · MIDDLESEX

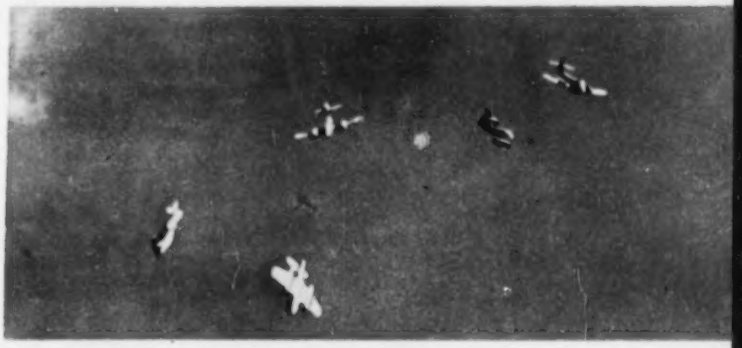
The opening of Ferryfield Airport is a sign of the widening scope of Silver City's unique work, in which de Havilland Propellers continue to play their essential and economic part.

DE HAVILLAND PROPELLERS

DH
PROPELLERS

In putting Great Britain on the map at Valenciennes the Meteor aerobatic flight of No. 64 Squadron were unintentionally on the map themselves—a marvellous cloud-map of the U.K. (and the tip of France) as our picture shows. The manner of the flight's break-up is illustrated below.

Meeting National de l'Air



Illustrated by "FLIGHT" photographs

SO fair stood the wind for France early on the morning of Sunday, June 27th, that our glossy new George-Able-King-How-Charlie sped us from dear old Croydon to Valenciennes-Denain in one hour five.

The Jimminy (as the controller was pleased to address that vehicle) having been turned out to grass, we stood ourselves a breakfast of beer and sandwiches and settled in to enjoy one of this year's series of Meetings Nationaux de l'Air. A "pre-meeting" (genuine French, this—*vide* programme) was arranged before lunch for the diversion of the early-comers and as a try-out for the big show, which came on in the afternoon.

The arrival of the *cortège officiel*, on the dot of two-thirty, was duly observed with martial and musical honours; but a moody wind frustrated a *stick tricolore* of parachutists from the school at Pau. Monique Caillard, a Government flying instructress, thereupon proceeded to put her specially modified Stampe single-seater through a succession of elegant, intricate and varied manœuvres, and M. Vinsonneau, in a Nord 2000 glider, severed all connections with a Salmson-engined Storch tug and rolled, looped and slid inverted down the sky with the greatest of ease and adroitness.

Our good friend Jacques Noetinger, on the Potez 75 anti-tank missile-platform, showed that he is as proficient a demonstration pilot as he is at publicizing French aircraft, or at writing articles and books, or drawing clever little sketches, or handling press-men or flying a Reserve-squadron Thunderbolt at week-ends, or controlling a meeting, or

Capt. Bodard, of the Belgian Air Force, on his low, slow run in the Meteor 8.

MEETING NATIONAL DE L'AIR . . .

broadcasting an account of it. Impressions of the Potez 75 in *Flight* of May 14th emphasized the ground-handling qualities of this extraordinary pusher; but one must see it for oneself, curtseying and bucking its way over rough ground at the rate of knots, to appreciate fully its unique qualities. One gathered, incidentally, that a French Air Ministry order is now a forlorn hope, though the Ground Forces would like some of the new "75s" if they could raise the funds.

Michel Berlin lived up to his titles of Aerobatic Champion of France, 1954, and Chef-Pilote de l'Ecole Nationale de St.-Yan, by very nearly turning his Stampe inside out. He is, of course, an absolute master of the art of fancy flying—flying in the tradition of world-champion Marcel Doret, who was (we were delighted to note) billed next on the altogether magnificently produced programme. Maestro Doret has been flying for 36 years. He has tested 43 prototypes, held 18 world records, is the world's champion aerobatic pilot not only on powered aircraft but on gliders too, has saved his life three times by parachute, flown 6,000 hours and demonstrated at 500 meetings. The apple of his steely eye is his Hispano-Suiza-engined Dewoitine D.27, which always reminds us of one of those gay, and altogether enchanting (if the tiniest bit elderly) ladies with whom France is so bountifully blessed.

Doret's awesome manœuvres include a figure which he calls a *Noeud de Savoie* (Savoy knot), and which is known in Fighter Command as a Cuban eight. (It is, in any case, a horizontal figure eight executed in a vertical plane.) To round off his show he makes an aerobatic descent from several thousands of feet, ending with a crabbed run along the enclosures and a spot landing—dead-stick all the time.

The R.A.F.'s contribution to the proceedings was the aerobatic flight of five Meteor 8s of No. 64 Squadron, and a lone Canberra of Bomber Command. And here arises the distasteful necessity of recording that, although "64" did wonderfully well in far-from-still air (the pilots were S/L. H. Bennett, F/L. R. J. Spiers, Sgt. P. J. Izzard, F/O. R. Dick and F/O. J. Heard) the Canberra's show was hardly worthy of the aircraft itself or of the Service which it graces. Too high, too distant, too staid—we leave our criticism at that, and pass on to compliment the pilot on the distantly observed upward roll as he left the scene.

The Belgian Air Force sent sixteen Thunderjets, which formated tidily, and the formidable Captain Bodard, who put a final flourish to his copper-plate Meteor exposition by relighting a Derwent close in front of the enclosures and then returning for a high-speed "rock-past."

A single Dassault Ouragan which passed smoothly and quickly by in various attitudes was piloted by Mme Jacqueline Auriol. When later she stepped out of a yellow Morane-Saulnier 733 at Valenciennes she received the ovation

The Sud-Ouest Djinn (left) was whisked round the sky with tremendous élan by Jean Dabos. In the second picture, France's aerobatic champion, Michel Berlin, appears to be laying the odds in a novel manner from the cockpit of his Stampe.

(Left) The Nord 2000 glider, superbly shown off by M. Vinsonneau. (Right) Dispersion of the Dassault Ouragans of the 12me Escadre de Chasse, wherein someone appears to have blundered.

of the day, and (such is her charm) quite distracted at least one spectator's attention from the rest of the aerial proceedings. That same spectator can nevertheless report with conviction that Jean Dabos did some very remarkable things with the compressed-air-driven Sud-Ouest Djinn helicopter.

When complimented on his pre-meeting performance, M. Dabos paid tribute to the Djinn in no uncertain terms, though he added that his intimate knowledge of its behaviour was a help. Another factor in his demonstration was a stiff wind; but, on the other hand, the Turboméca Palouste was turning at only 31,000 r.p.m. instead of the permitted 34,000.

The Djinn itself was a single-seater, flying at a gross weight of 520 kg, and, though the newer two-seater weighs 590 kg, one was assured that it handles in the same ready manner and that it will soon be benefiting from a 14 per cent increase in mass flow. A pre-series of ten Djinns should be completed before Christmas, and 100 production models next year.

The 12ine Escadre de Chasse, on tip-tanked Ouragans, made a brave showing, and, like the similarly mounted Patrouille de France, won the plaudits of their countrymen. The Patrouille is composed of four of France's finest military pilots and was flying under the command of Capitaine Labaye. Like "64," it signs off with a spirited break-up.

Entered on the programme as "Les Bataillons du Ciel," the penultimate event was a smart piece of work by three Dakota-loads of parachutists. We watched it from our own aircraft at dispersal, and there we heard and felt a Mystère II place its supersonic bangs on the airfield. We heard, too, the voice of its pilot, M. Tesson, just before he abandoned the aircraft, and—we are sad indeed to record—fell to his death, his parachute having failed to open.

We left forthwith, cleared Customs at Le Touquet, and nipped into Croydon before dusk, after the sort of Sunday outing which France offers so invitingly, and which the "Jimminy" allows us to enjoy.

H.F.K.

Marcel Doret conveys his greetings.

Doret's silver and red Dewoitine D.27.

Below, the versatile Jacques Noetinger, portrayed at lower right, makes a dusty departure in the Potez 75 tank-buster. Tank-like itself, the "75" takes rough ground in its stride.

Super Constellation: this type is used by Qantas for their trans-Pacific route from Sydney to Vancouver via Nandi, Canton Island, Honolulu and San Francisco.

TRANS-PACIFIC

TWO famous Commonwealth airlines compete for traffic on the 8,000-mile route between Sydney and Vancouver. Canadian Pacific Airlines, now operating a fleet of four DC-6Bs, have been flying the route since 1949. In the same year British Commonwealth Pacific Airlines were formed jointly by the Australian, British and New Zealand Governments to link Australasia with America and Canada, and this company's DC-6s continued to fly trans-Pacific services until a few weeks ago. The Sydney-Vancouver route is now part of the Qantas Empire Airways network; on May 15th Q.E.A.'s Super Constellation flagship was introduced to service on this route.

Canadian Pacific operate a weekly round trip between Vancouver and Sydney with a "mixed bag" DC-6 (carrying both tourist and first-class passengers). At present, Qantas Super Connies operate first-class services only. The Australian airline offers six return flights per month between the two cities, plus a fortnightly service terminating at San Francisco. The first-class return fare between Sydney and Vancouver is £542 9s, and a tourist return ticket costs £434.

According to the direction in which he flies, a passenger travelling on this route loses or gains a day. The Sydney-bound C.P.A. service, for example, leaves Honolulu for Nandi (Fiji) at 9.30 p.m. each Saturday; the DC-6 crosses the International Date Line *en route* and thus does not reach Nandi until 7.15 a.m. on Monday (local time).

The reverse effect is shown by quoting from the Qantas timetable for the Super Constellation service leaving Sydney for Vancouver at 11 a.m. each Saturday morning. This aircraft flies to Nandi, makes a transit stop of 1 hr 20 min, takes off again for Canton Island and—having crossed the Date Line—theoretically arrives at Canton 7 hr 5 min before it left Sydney.

C.P.A.'s services stop at Auckland, Nandi and Honolulu, and Qantas flights call at Nandi, Canton Island, Honolulu and San Francisco. In the case of Qantas, a separate Sydney-Auckland connection is provided by DC-6s.

Although both airlines offer fast and comfortable services, many travellers would undoubtedly prefer to see more of the Pacific transit stops than present schedules permit. This will become possible as traffic increases and frequencies are stepped up. A daily frequency, for instance, would enable the passenger to spend a full day at each calling-point and yet complete his trans-Pacific journey inside a week.

DC-6B: C.P.A.'s two-class aircraft make three transit stops—at Honolulu, Nandi (Fiji) and Auckland.

ALVIS

LEONIDES

The Alvis Leonides Helicopter Engine, a 520 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 645 lb. Power/weight ratio 1·24 lb. (0·562 kg.) per b.h.p. Overall diameter 41·5 in. (105 cm.). In quantity production for the Bristol 171 and 173, also in extensive use by the Royal Navy in the Westland Dragonfly.

ALVIS LIMITED · COVENTRY · ENGLAND

Three of the Seven

MILITARY ROLES OF THE VERSATILE

Pembroke

COMMUNICATIONS

With full service radio and equipment a crew of 2 and 8 passengers range 575 miles (925 kms.) cruising at 172 m.p.h. (278 kms.p.h.) at 8,000ft (2,438 ms.).

FREIGHTING AND SUPPLIES

Quickly removable seats expose large cabin for bulky freight stowage. Main door opening 5ft. 2in. (1.57 ms.) x 4ft. 2in. (1.27 ms.) permits parachuting supplies.

AIR SURVEY

Vertical, oblique and forward facing oblique camera apertures, with fuel for 1,000 miles (1,609 kms.) range. Accurate photography from over 20,000ft (6,100 ms.).

Adapted also for six stretcher Ambulance, Navigation/Bombing training, long-range Ferrying and twin-engine Pilot Training.

HUNTING PERCIVAL AIRCRAFT LTD

(Formerly Percival Aircraft Limited)

A Hunting Group Company

LUTON, BEDFORDSHIRE, ENGLAND AND AT TORONTO, CANADA.

128/288

UNIVERSAL TEST RIG

RECENTLY developed by the Hymatic Engineering Company of Redditch, Worcestershire, for the Ministry of Supply is a universal test rig for use with all the high- and low-pressure pneumatic and vacuum equipment fitted on military aircraft. The prototype model is capable of testing any existing type of aircraft compressor, vacuum pump, valve, ram or similar component. A comprehensive group of circuits with their associated controls, gauges and measuring instruments enable the rig to simulate, in the workshop, any set of operating conditions encountered in flight.

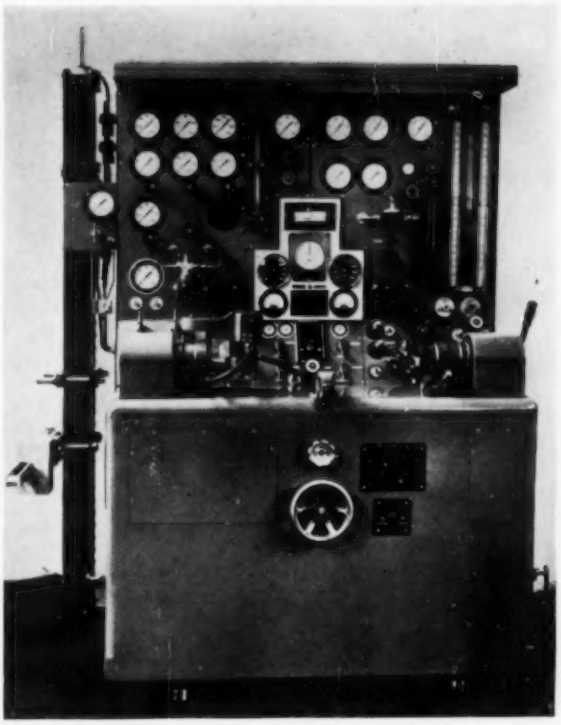
The test rig consists of four main sections, each with its own instruments and controls. The first is for testing high-pressure pneumatic components; the second for vacuum pumps, low-pressure air pumps and components; the third for the hydraulic testing of pressure vessels and the fourth for rams. The first two sections are, in turn, sub-divided into constituent circuits, separately piped but inter-connected in function.

The first section, dealing with pneumatics, consists of four distinct circuits; air bottle, receiver, line and brake. Together they test compressors, pressure regulators, reducing valves, non-return and relief valves, pressure vessels, oil-and-water traps, anti-freezers, storage bottles, stop and selector valves, rams, brake differential units, pressure-maintaining and shuttle valves and flow restrictors.

The vacuum and air-pump testing section consists of two sub-circuits. The first measures suction pressure by means of manometers mounted on the front panel, and delivers the pump exhaust either to a large oil precipitator housed in the main body of the rig or to an oil separator of the standard airborne type, which simulates actual working conditions in flight. The second sub-circuit, designed to test low-pressure compressors, incorporates an oil-flow indicator, a standard aircraft oil receiver, an air intake throttle and a valve which regulates the orifice pressures.

The two remaining sections of the rig are basically simple. The hydraulic section for testing pressure vessels consists of a hand pump with non-return and stop valves and two connections, the associated oil reservoir being housed on the body of the rig. The fourth section is that for testing rams. Rams undergoing dynamic tests are mounted on the left side of the rig and the thrust is applied to the piston of an oil dashpot. Operation of the ram expels oil from the dashpot through a bleed valve into a tank which supplies oil to the other side of the dashpot piston. The speed of stroke of the ram may be varied by an adjustment of the bleed valve, and the hydraulic load developed is indicated on a gauge fitted near the dashpot.

The basic power unit for the rig is a reversible 440 v. 3 phase 50 cycle 7½ h.p. electric motor, flange mounted on an FU gearbox with a continuously variable ratio from unity to 10:1.



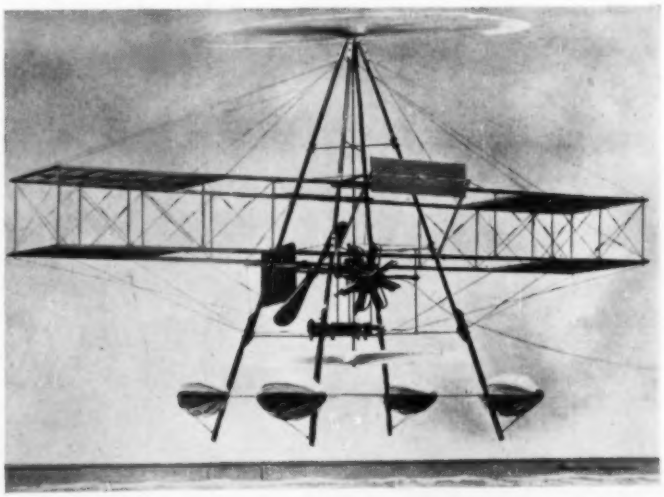
In spite of its tremendous versatility, the new Hymatic rig is neat and pleasing in appearance. The vertical pillar up the left-hand side is for ram testing

TRAVERS AYERS

THE death occurred on June 16th of Mr. Travers Ayers, aged 66, one of this country's pioneers in the design of aircraft capable of vertical take-off. Although no successful full-size Ayers aircraft was constructed, a model—the "Travers Ayers Hovering Aeroplane"—was built and flown, and was described in *Flight* of September 20th, 1913. From this description we give the following extracts:—

"The machine is designed in the form of a tetrapod with cross bracings, this being the strongest method of construction. The engine is adjustable to allow for the most suitable centre of gravity being obtained and is mounted within the framework, and geared to rotate two vertical shafts in alignment, driving them in opposite directions, each of the shafts being provided with a propeller. . . . The vertical propeller can be connected with the motor by means of a clutch to enable the machine to fly in a horizontal direction. Horizontal propellers thus give the lift and the vertical propeller gives horizontal flight, or the horizontal propellers can be stopped and the side planes (which are composed of louvres to give least resistance in vertical flight and operated from a central control), can be closed, thus enabling the machine to fly in the manner of a biplane; rudder and elevator being provided. The lower ends of the tetrapod are fitted with suitable floats to enable it to rise from and descend upon water.

"In the case of a full-size machine the pilot and engine would be enclosed in a cabin furnished with windows or apertures to enable observations to be made in all directions. . . . When making a flight, in the case of a full-size machine, the pilot sets the two horizontal propellers in motion, the vertical propeller being held out of action. The louvres are set in the open position. When a suitable elevation has been reached the propellers are slowed down to the required speed, thus enabling the machine to hover, or the louvres are brought into the horizontal position and constitute sustaining planes. The vertical propeller is now thrown into action and then the horizontal propellers are slowed down, or in some cases entirely stopped, the machine then flying as a biplane." The accompanying photograph was taken by Mr. Travers Ayers at the time of the experiments.



Mr. Travers Ayers' V.T.O. project, seen here in model form, was described in "Flight" in 1913.

MARTIN MATADOR

Transonic Pre-fabricated Missiles of the U.S.A.F.

ONE does not normally expect to receive even portions of pilotless bombers through the post, but *Flight* recently accepted a small metallic object bearing a 10-cent stamp and a Washington postmark which turned out to be a specimen portion of the Martin B-61 Matador. It had been sent by the Editor during his recent global tour, and provided much diversion in the efforts that were made to damage it.

The basic structure, and most of the skin, of this remarkable aircraft is formed from an all-metal sandwich, consisting of an inner layer of light-alloy sheet, a honeycomb of metal foil and a thick outer skin, the whole being heavily bonded together with a thermosetting resin. The sheet is supplied in bulk to the Martin B-61 plant, and it is there simply "cut to size" with a bandsaw. The portion in our office, measuring 2in by 3in by 11/16in, and weighing about 1oz, resisted all our attempts to effect permanent distortion—except, of course, at the corners.

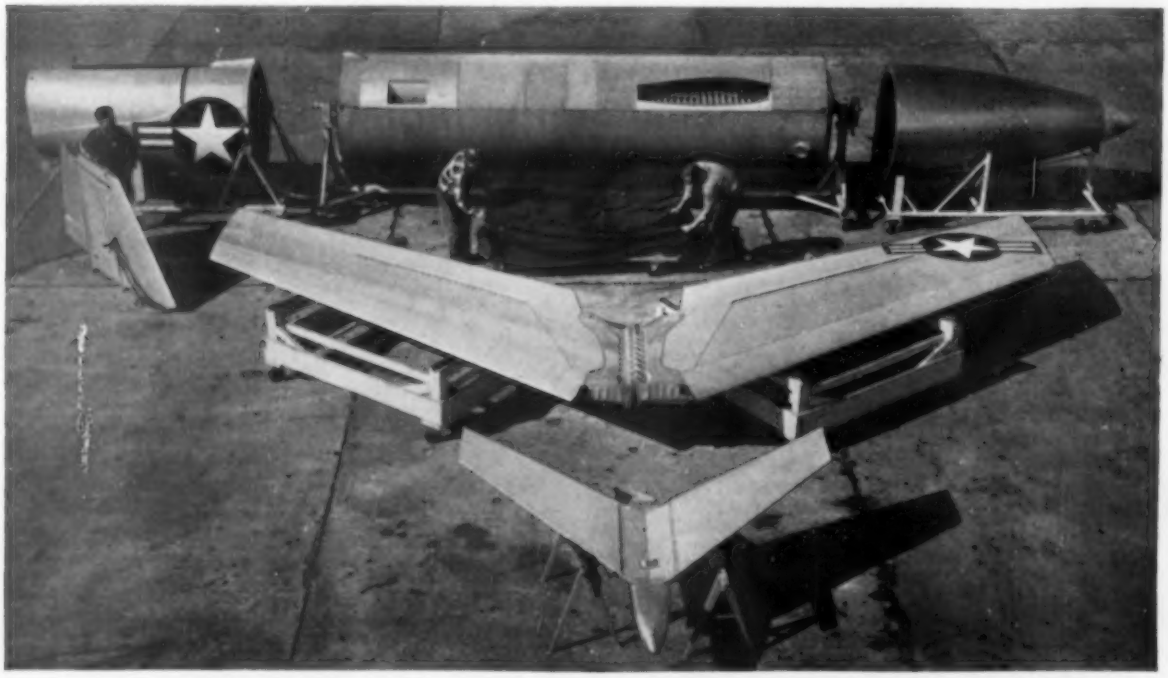
This novel structure not only lends itself well to a very high rate of production, but also facilitates division of the aircraft into sub-assemblies. In fact, quoting Martin, "For the first time in the history of the aircraft industry, a combat-type aircraft is being built in sections which are assembled in the field."

Before discussing the structure further, it may be recalled that the Martin B-61 Matador is a shoulder-wing monoplane, with a span of 28ft 7in and a length of 39ft 6in. Power is provided by a special version of the Allison J33 centrifugal turbojet, delivering about 7,000 lb thrust. Owing to the expendable nature of the aircraft the engine is run very hot, uses few critical materials, and has much simplified accessory systems. The Allison company have also revealed that tolerances are eased, compared with those of "normal" J33s, and no inspection is required after the initial test-stand run-up. The engine is fed with air from a ventral flush intake.

The Matador is made in seven portions. These are then packed in weatherproof crates, and shipped to the appropriate U.S.A.F. pilotless bomber unit. Final assembly may take place thousands of miles from the Baltimore factory, and years after the components have left the assembly line. A particular point worth noting is that Martin have at last managed to achieve complete interchangeability, on a par with that long practised by the car industry. No portion of a Matador is made expressly for any other portion, and each component is regarded solely as a component, and not as a portion of any particular aircraft.

Martin describe the Matador launcher as "the world's smallest airport." Be that as it may, the B-61A certainly makes an awesome picture during its rocket-boosted take off. The rocket is under the rear fuselage.

The Matador was first flown at Holloman A.F.B., New Mexico. Operations here were restricted by the limited size of the range, and the missiles were flown in figure-8s and circles. It was only



The Matador surface-to-surface missile is made in seven components which are weatherproofed and crated for distribution to U.S.A.F. units.

when the B-61A was supplied in numbers to the Air Force's Missile Test Centre at Patrick A.F.B., Florida, that operational development really got under way. From Cape Canaveral, a fully instrumented range over 2,000 miles long stretches away across the sea to the south-east, and large numbers of Matadors have been expended along this track during the past two years.

The missile is launched, with rocket assistance, from a zero-length launcher mounted upon a self-propelled vehicle. After jettisoning the booster bottle, the Matador is designed to cruise at a high subsonic speed for up to about 600 miles. Control is by radio, but no details are available. At the appropriate point the missile dives to reach supersonic speed before striking its target.

At present the range of the Matador is greater than that of the initial ground-control station. It has been suggested that the controller might be positioned as close as possible to the target, with the firing base well to the rear; the problem did not arise during tests, as it was then possible to pass control from one station to another. There is no means of pre-setting the final target dive, which must—at present—be controlled by the final radio station. (An autopilot is fitted, for use during the first few seconds of flight.)

During test firings, precautions include the use of a chase plane (certainly an F-86) to shoot down the missile in an emergency, a ground-controlled circuit to destroy the missile in the air if it wanders off-course, and a self-destruction "suicide" circuit which is triggered if control is lost for more than a few seconds.

The first unit to be equipped with the B-61A is the 1st Pilotless Bomber Squadron of the Tactical Air Command, which has been based at Bitburg, in the American Zone of Germany, since March 9th. This unit has 53 officers and 543 airmen; the number of missiles assigned to a squadron is officially "classified," but it was stated last week that No. 1 Squadron has about 75. A second unit, the 69th Squadron, is scheduled to move to Europe this year.

During last week's demonstration at Bitburg it was shown that a Matador can be fired about 40 minutes after the packing cases are opened. A Matador squadron is highly mobile, and 90 minutes are considered sufficient time to set up all the weapons for firing. As for the punch which the missile can deliver, it has been revealed that an atomic warhead can be fitted, although several other forms of nose section are possible alternatives. In fact, there is no reason to suppose that, for certain types of mission, a Matador could not be made to fly back to its base, although normal landings are unlikely.

It is not known whether any Matadors have been launched in Europe, but that is the intention. The missile certainly shows promise of being, on a tactical scale, a potent deterrent to aggression, and it is the U.S.A.F.'s aim to set up a stockpile of crated Matadors the world over. There is also a B-61B version, which is to equip tactical units now being activated.

This view of a Matador set up for assembly shows the simple trestling required. The crew that put the pieces together know that everything will fit, without using any jigs or equipment other than simple hand tools.

A.R.B. LUNCHEON

THE seventeenth annual report of the Air Registration Board was summarized on page 25 in our last week's issue. On Thursday, July 1st, the annual luncheon was held at the Savoy Hotel, London, the guest of honour being the Minister of Transport and Civil Aviation, Mr. A. T. Lennox-Boyd.

Lord Brabazon, chairman of the A.R.B., proposed the toast to Mr. Lennox-Boyd, welcoming him as "our Minister." After talking briefly about the A.R.B. report and of the Board's solvency—thanks to the treasurer, Mr. J. J. Taylor—Lord Brabazon said: "This year we have had two blows. First of all the report from East Africa on the Viking crash. I have conducted enquiries of the same sort as that entrusted to Sir John Gray, and I fully understand his feelings in the matter. The tragic occurrence and lives lost and the drift in the enquiry to the conclusion that no one was to blame is exasperating. I will not deal with the other things he said, but he held that we were partially to blame for our inspection methods. I only wish we had known that that point of inspection would arise in the enquiry for, had we known, we would have sent somebody out to explain our procedure, when the matter would have been cleared up, I feel confident, and no accusation made against ourselves." Lord Brabazon thanked the Press, lay and technical, for the understanding that they showed over this matter.

"The second point is the Comet. That is, of course, a running sore. It is curious that after thirty thousand hours operation, two disasters should have occurred to two aeroplanes. What was the cause? What deterioration set in to make these machines safe to start with and then dangerous? Will this phenomenon compel authorities throughout the world to revise present-day systems of certification? Never has there been such a concentration on finding out the cause. The great firm of de Havilland, B.O.A.C., ourselves and the R.A.E., have all concentrated upon it. We owe a debt of gratitude to the Ministry of Supply for allowing Farnborough to devote their tremendous powers to the problem. We also extend our thanks to the Royal Navy for their most astonishing work, under the most difficult circumstances imaginable, for recovering so many parts.

"As you know, the boss of Farnborough last year was Mr. Hall—now Sir Arnold. Never was an honour so well deserved. He is a remarkable man with the most catholic knowledge of science, in many branches. He has a remarkable staff of competent scientists. Farnborough is a happy ship, and together this great team threw itself as has never been done before into the business of attacking this problem.

"Suspicions of this and of that have been hunted down and showed no promise. The cussedness of the inanimate has never been more potently demonstrated.

"Recently quite involved, ingenious and expensive apparatus has been installed to make certain tests, and I think it only right to tell you that from these tests have emerged some results that promise explanation of the trouble. I will leave it at that. It is for the R.A.E. when wholly satisfied, to make what statement they think fit on the matter."

Lord Brabazon went on to praise the Viscount which was astonishing the world, and he concluded: "Aeronautics is a very restless science. When we get over our troubles the knowledge and experience we have gained will be of benefit to the whole world." He added that we should not forget that we alone pioneered high-flying civil jet aircraft.

Replying to the toast, Mr. Lennox-Boyd in a masterly speech touched on many topical aviation subjects. He said that no problem was more important nor gave his Ministry more anxiety than the problem of airworthiness and the security of British airliners. He felt that the Comet field of investigation was narrowing and he, too, said that it was impossible to exaggerate the importance of the work that Farnborough was doing. He spoke in favour of reciprocal acceptance of Certificates of Airworthiness with America for turbine aircraft—he had previously instanced the Viscount.

Next, Sir Frederick Handley Page briefly and humorously proposed the toast of the guests, and he spoke of the extremely democratic way in which things were discussed at A.R.B. meetings. He paid a tribute to Rolls-Royce and coupled his toast with the name of Lord Hives who was to reply.

Lord Hives, in a very sincere speech, said that his company strove for perfection but always just missed it. On questioning his staff he had found a unanimous appreciation of the help and helpful criticism received from the A.R.B.

CLUB AND GLIDING NEWS

AT Yeadon airfield, re-opened for club flying in January, the Yeadon Aero Club is now operating three Austers, one Tiger Moth and two Rapides, in addition to four privately-owned machines belonging to members. Up to the end of May a total of 412 hours had been logged, and first solos made by club members Burnett and Crabtree and A.T.C. Cpl. Andreas. The present manager of the club, Captain H. V. Worrall, was C.F.I. at Sherburn prior to 1931, and became chief Avro test pilot at Yeadon during the war. The chairman of the club's board of directors, Mr. L. S. Dawson, has been connected with aviation in Yorkshire since learning to fly at Sherburn in 1926.

NEWS of the B.G.A. appeal for the financing of the World Gliding Championships (Great Hucklow, July 20th-August 4th) is that the amount so far received and guaranteed is sufficient to ensure basic organization and facilities. Mrs. Alex Orde (the association's secretary) has told us, however, that the position is still extremely tight, and that a final effort is being made to obtain further contributions in order to make an improvement over the minimum standard now guaranteed.

Contributions should be sent to the B.G.A. at Londonderry House, 19, Park Lane, London, W.1.

Other news of the Championships is that the team captain of the British entry is to be Hugo Trotter, one of the Surrey Gliding Club instructors and, incidentally, the editor of the "Lasham Newsletter." Not entirely unexpected is the confirmation that the vee-tailed K.1 will not be ready in time for the contests; Philip Wills will therefore be flying his Sky, which he has been keeping in reserve.

IN connection with the World Gliding Championships, an International Gliding Exhibition is being arranged in London by the magazine *Sailplane and Glider*. It is to be held at the Tea Centre, 22 Regent Street, London, S.W.1, from July 17th-24th, and will include photographs, films and models illustrating the many aspects of gliding as a world sport. The British Gliding Association, the Science Museum and the meteorological authorities are contributing exhibits, and Mr. C. H. Gibbs-Smith, M.A., has advised on a special display on the history of gliding. The exhibition's hours of opening will be from 10.30 a.m. to 6.30 p.m. each day (5.30 p.m. on Saturdays); admission charges are 1s (adults) and 6d (children).

WE regret to record the death recently of Mr. Charles Espin Hardwick, M.B.E., president of the Midland Gliding Club since 1936. Illness prevented Mr. Hardwick, who was 60 years of age, from seeing the club's new premises at Long Mynd. After learning to glide with the London Gliding Club in 1930, he founded the Midland club in 1934 at Hamstead Hill, Handsworth, the first club house on the Long Mynd being built two years later. Mr. Hardwick had performed much exploration into standing waves as part of his investigation of the atmospheric characteristics over and near the Mynd.

A view from the Fair Oaks tower during the afternoon. The static aircraft park included a Moth Minor Coupé and a Chrislea Super Ace.

"Flight" photographs

The "Evening Standard's" S-51, swinging and swaying before the crowd at the Fair Oaks At Home described below.

AN unexpectedly large crowd made their way to Fair Oaks on June 27th, when the two resident clubs were jointly "at home." Programmes were sold out within half an hour, despite the fact that the forecast showers were heavy and prolonged and the bright intervals correspondingly brief. It was a lively display, with the accent on private flying—no jets, nothing noisier than the *Evening Standard* S-51, nor larger than a joy-riding Rapide.

Tiger Moth formations provided a colourful curtain-raiser. One trio appeared in the familiar red finish of the London Transport Flying Club; the second, in silver and green, came from the Fair Oaks Aero Club. The latter's C.F.I., W/C. C. F. Arthur, stayed airborne for a typically polished display of aerobatics. His pupil-and-instructor act, next item but one, was a joy to watch, and commentator Ted Baker's helpless laughter was by no means feigned. "Dead Eye from the Middle West" turned out to be Fair Oaks club-member Don Doyle of the U.S. Navy, toting a .45 with one hand and holding an airborne Tiger Moth with the other. He disposed of a row of bottles with suspicious accuracy.

A fine aerobatic exhibition by the gleaming Blackburn B.2 trainer took us back 20 years or so. It came as no small surprise to learn that the pilot was not "Tim" Wood, as programmed, but the chief aerodynamicist of Blackburn and General Aircraft, Mr. B. J. Watson, who had flown the B.2 the previous week at Coventry. Another expert performance came from parachutist Arthur Harrison, who dropped from an Auster 2,100ft over the crowd, pulled the D-ring after a 7 sec delay and drifted to a perfectly chosen landing-spot in front of the enclosure.

The bombing competition, won by Mr. C. Baxter in a Tiger Moth, produced an impressive shower of porridge-filled paper bags. Restricted to a minimum bombing height of 250ft, some aimers apparently found it hard to spot the target—but the crowd escaped, so all was well. The Fair Oaks Cup, awarded for the best Tiger circuit, went to Mr. W. Mitchell, and the aerodrome's chief engineer, Mr. S. Webster, was a popular runner-up. Other prizes were won by Messrs. Bagley, in a Tiger Moth (time of arrival), and Snook, in a Gemini (concours d'elegance).

THE rally and air race meeting of the Vintage Aeroplane Club at Denham during the August Bank holiday weekend will begin with a lunch patrol between 11.30 a.m. and noon on Sunday, August 1st. In the afternoon, flying competitions and displays will take place, and in the evening a film show on pre-war flying will precede a cocktail party at the Gayton Hall Hotel, Harrow.

On Monday, August 2nd, the first event will be the Harmel Trophy Race, four laps of a 17-mile closed circuit, for which any aircraft with a top speed of more than 100 m.p.h. is eligible. After lunch, the annual West London Trophy Race will be held over the same circuit, the first seven aircraft home in each of these two races going forward to the Chiltern Hills Trophy Race at four o'clock. The results of this race will count towards this year's British Air Racing Championship.

The meeting is not open to the general public, but only to members, guests and visitors arriving by air. The Vintage Club extends a welcome to those pilots wishing to stay for the week-end; accommodation can be arranged at an inclusive charge of two guineas per head.

HELPING THE BRITANNIA TO FLY

The Smiths group are again proud to make an important contribution to another major British aircraft. Equipment by Smiths, Kelvin Hughes, K.L.G. and Waymouth Gauges includes the SEP2 Auto-pilot and flight, navigational and engine instruments.

SMITHS

KELVIN HUGHES

KH

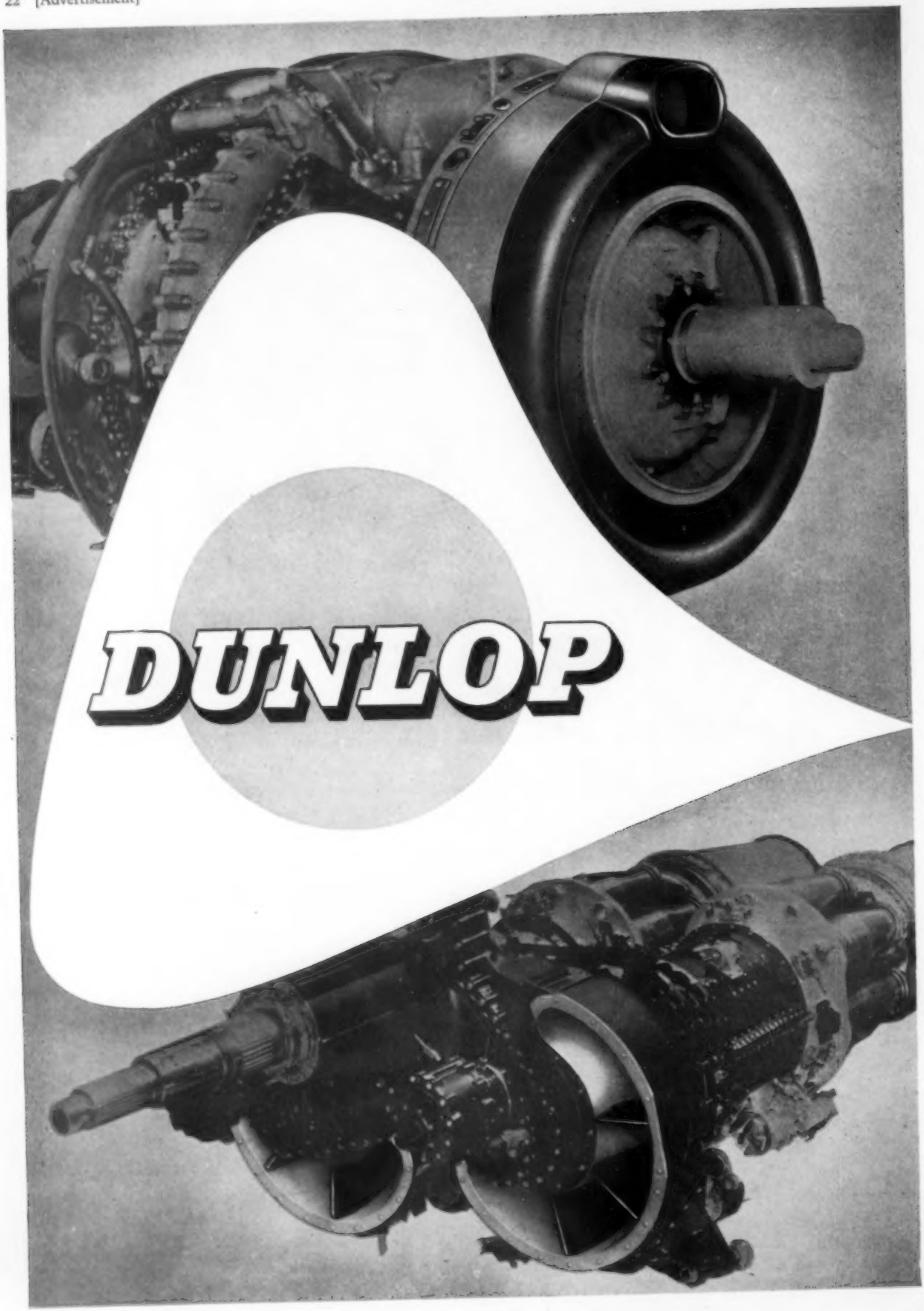
KELVIN & HUGHES (AVIATION) LIMITED
BARKINGSIDE & BASINGSTOKE

SMITHS AIRCRAFT INSTRUMENTS LIMITED

The Aviation Division of S. Smith & Sons (England) Ltd.

CRICKLEWOOD · LONDON · NW2 · ENGLAND · TELEPHONE: GLADSTONE 3333 · TELEGRAMS: AIRSPEED, TELEX, LONDON

ENA 4


DUNLOP

ELECTRICALLY-HEATED RUBBER MATS PREVENT ICE FORMING

New Thermal Anticing System by Dunlop

Latest development by Dunlop in the important field of ice-prevention in aircraft is a thermal anticing system on the electric blanket principle. Suitable for all operating conditions the system consists of electrical heater circuits sandwiched between layers of synthetic rubber.

Tailored to fit

The sandwiched circuits, tailored to fit individual applications, are attached directly to metal surfaces without impairing aerodynamic efficiency. They are designed to work off the aircraft's normal electrical system. Wattage can be varied as necessary.

Can be automatic

The circuit can be heated continuously or in cycles—or in a combination of both—by means of a controller. With an ice detector, the installation becomes fully automatic.

Many applications

In addition to jet engine intakes, shown on the opposite page, this system of protection is suitable for cabin heater intakes, air intakes, radio antennae, spinners and shutters.

THE HEAT IN THE SANDWICH

How the Thermal Mats are constructed

Above is an illustration of an intake with the top layer of rubber removed to expose the heater element.

An electrical circuit in nickel alloy is cut from metal strip less than ·010" thick. It is applied to the metal intake between layers of unvulcanised heat resisting chloroprene. Finally the entire assembly is subjected to heat and pressure to embed the circuit securely between the plies and cure the rubber compounds.

This curing or vulcanising process produces the required weather resistance and other physical properties necessary to ensure the efficiency of the system.

DUNLOP RAMS OPEN THE EYES OF REHEAT JETS

Designed to operate the 'eyelids' of jet re-heat nozzles, these Dunlop rams operate at temperatures exceeding the melting point of tin at 250°C. Actuation is controlled by a simple two-position solenoid operated valve. High temperature air filters and pressure reducing valves have also been developed for use with these rams.

Dunlop makes things better for everyone

4H/607

new

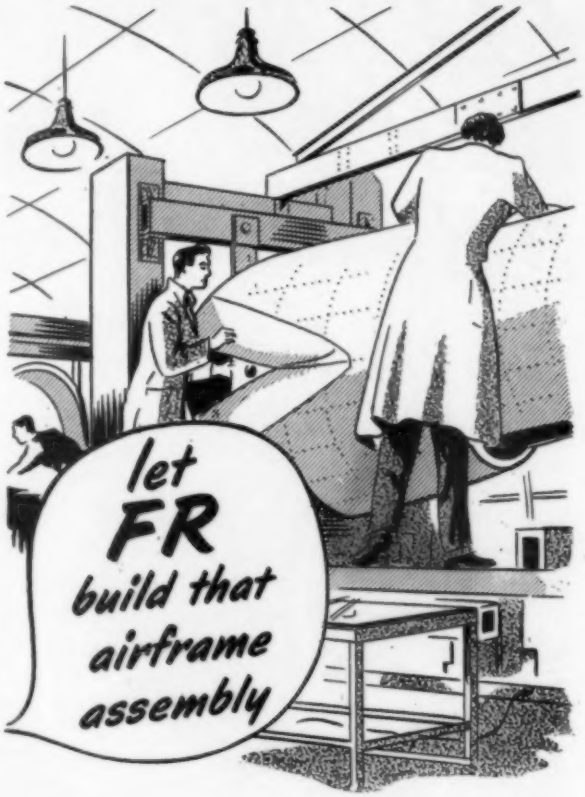
Austin Reed sports trousers
new cut • new cloths • new colours
new waistband • new front
new pockets • more comfort
and elegance all round

5½ guineas

Makers of uniforms for Officers of the Royal Air Force

AUSTIN REED
Of Regent Street

LONDON AND PRINCIPAL CITIES



FR SERVICES

to the aircraft industry

The manufacture and construction of airframe components, complete assemblies, sub-assemblies, details and spare parts is but one of the many specialist services for which the F.R. organisation is equipped to undertake in support of the Nation's super-priority drive. Currently absorbing *part* of F.R.'s extensive capacity in this sphere is a production line turning out rear-half fuselages for the Royal Navy's *Sea Hawk* jet fighter—confidently entrusted to F.R. by Sir W. G. Armstrong Whitworth Aircraft Ltd. There is capacity available for further undertakings of this calibre as well as for repair and overhaul, modification and conversion and flight testing of all types of aircraft.

FLIGHT REFUELLING LIMITED
Pioneers of Flight and Pressure Refuelling
Tarrant Rushton Airfield, Blandford, Dorset
Tel.: Blandford 501. *Telegrams: Refuelling, Blandford*

T.A. 6453

THE INDUSTRY

Aircraft-loading Conveyor

SPECIFICALLY designed for loading and unloading aircraft —but clearly capable of varied industrial applications also— the new Fourways electric mobile conveyor was exhibited for the first time at the recent Mechanical Handling Exhibition. The "hinged-boom" conveyor track is adjustable through a height-range suitable for any type of aircraft.

The 21in-wide track, which is reversible, consists of Renolds 4in-pitch links of 6,000 lb breaking strain, attachments welded to each link carrying hardwood slats. The track is capable of handling units up to 2 cwt, with a maximum load of 6 cwt, at a speed of 50 ft/min.

The two track-booms are electro-hydraulically operated, the controls being located in the driver's cab, as are those for the track itself.

The conveyor is mounted on a standard Morrison-Electricar 20-cwt chassis fitted with a 36-cell Exide battery of 240 ampere-hour capacity which also provides power to the conveyor unit. The arrangement of the battery box gives a balanced weight-distribution.

There is a seat for a loader behind the driver's cab, and a tow-bar is fitted. The conveyor is manufactured by Fourways (Engineers), Ltd., New Works, Thornwood Common, Epping, Essex.

The new Fourways electric mobile conveyor, showing the hinged-boom track.

Solar in London

IT is announced that Solar Aircraft Company of San Diego has opened an office in London, under the management of Mr. Patrick Johnson, A.F.C., C.P.A., A.F.R.Ae.S. (who retired from the joint managing directorship of Power Jets, Ltd., last year).

Solar, one of the biggest independent manufacturers of precision heat-resisting sheet-metal components in the world, also build two gas turbines of their own design—the Mars of about 50 h.p. and the Jupiter of about 500 h.p. The company, which also manufactures afterburners and ceramic coatings, intends to secure the manufacture of its products in the U.K. for home and export, and to make other licence arrangements in European territory. It is also interested in arranging licences in the U.S.A. for promising British products. The new office is at 8 Clarges Street, London, W.1 (Grosvenor 7938).

For Small-bore Grinding

IN the grinding of small bores there are problems concerned with the difficulty of driving spindles efficiently at the very high rotational speeds necessary to secure a useful cutting speed of 4,000-5,000 ft/min; these speeds may be as high as 100,000 r.p.m.

Mollart Engineering Co., Ltd., of Kingston By-pass, Surbiton, Surrey, have developed a "high-frequency spindle," consisting basically of a unit-built spindle and H.F. induction motor. The rotor, which is mounted directly on the spindle, is the only moving part of the drive and carries no brushes or other contacts. In order that the motor may be of minimum size a coolant jacket surrounds the stator, whilst continuous lubrication is provided by oil mist.

The motor will run at slightly under 90,000 r.p.m. when operated on a 1,500-cycle supply. A.C. of such a frequency is obtained from a motor and alternator which can be used to supply current to a number of spindles simultaneously.

Details of the system, and of an initial range of spindles which the company is supplying, are given in a recently issued leaflet.

MR. W. H. McFADZEAN, C.A., appointed chairman of British Insulated Callender's Cables, Ltd., on the recent retirement of Sir Alexander Roger, K.C.I.E. Now fifty-one years of age, Mr. McFadzean originally studied law and then became a chartered accountant; he joined British Insulated Cables in 1932 and was appointed to the Board of B.I.C.C. in 1945. He became chief executive in 1950 and will continue to act in that capacity.

Sugar-cane Runway-filler

INCREASINGLY stringent requirements for runway and apron construction have focussed attention upon the efficiency of joint-fillers, which perform the important duty of excluding water from the foundation and subsoil, and which also prevent the growth of weeds.

It is essential that the filler shall be able to contract and expand, and an Air Ministry requirement is that the material shall return to 70 per cent of its original thickness after 50 per cent compression.

A filler now being produced by Celotex, Ltd., North Circular Road, London, N.W.10, is claimed to have shown a recovery of 93 per cent during tests in a laboratory approved by the Air Ministry. The material, known as Flexcell, is of an unusual nature; it is prepared from sugar-cane fibres—which are highly resilient—imported by the company from the West Indies. For use in tropical countries, Flexcell is treated to make it resistant to termites.

Repetition Marking of Components

MANUFACTURERS of aircraft accessories of a kind normally manufactured in large quantities—e.g., electrical details—should find useful scope for a high-speed marking machine now being produced by Rejafix, Ltd., of 81 Fulham High Street, London, S.W.6. Developed from a hand-operated machine made during the war for marking aircraft radio components, it is capable of automatically numbering and/or lettering over 5,000 articles an hour.

The machine will mark articles of any material—metal, plastics, glass, porcelain, wood—and can place the imprint on irregular surfaces. The basic principle is the use of a rubber pad to which an inked impression of the type is repeatedly transferred, the pad and each article being brought into contact after inking. The resilience of the rubber allows an identical impression to be transferred, even though successive articles may have different contours and diameters. Special inks are available for use on various materials, and the range includes a ceramic ink for firing into glass. It is stated that Rejafix marking equipment has been installed in one of this country's largest sparking-plug factories.

IN BRIEF

Sir Cullum Welch, O.B.E., M.C., has joined the Board of C. C. Wakefield and Co., Ltd. He has been the company's legal adviser for over 25 years. Sir Cullum's appointment follows the resignation of Mr. Holland Young Blades, who has served Wakefields ever since their foundation 55 years ago.

* * *

Hiduminium Sheet and Plate is the subject of the latest technical data booklet published by High Duty Alloys, Ltd., Slough, Bucks.

* * *

The B.S.I. has published a new specification for steel tubes for aircraft—*British Standard T.61, Chromium-nickel heat-resisting steel tubes (suitable for welding)*. This Standard will replace D.T.D. 491. Copies are obtainable at 1s 6d from the Sales Branch, British Standards Institution, 2, Park Street, London, W.1.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Agricultural Requirements

WE have read with great interest the articles you have published recently in your magazine dealing with "Aircraft in Agriculture."

As a New Zealander and Australian respectively, we have some knowledge of the specialized requirements for this type of aircraft and the conditions under which they must operate, one of the writers having had close contact with the top-dressing industry in New Zealand from its beginnings. We find that there is a lack of appreciation by the industry in this country of the type of aircraft required and the possibilities for its manufacture in large numbers.

Your comment at the end of the article, in *Flight* of June 11th, suggests that the Auster A.O.P.9 would prove eminently suitable. We do not agree and have listed below some of the reasons why:

1. The A.O.P.9 is a high-wing aircraft and this is very bad for pilot visibility in the steep turns which are necessary.
2. The relatively narrow track of the undercarriage would be unsuitable in crosswinds and on rough ground. Also, it is normal practice on short fields to have the throttle wide open and the tail up by the time the pilot has completed his turn into wind.
3. The initial rate of climb is insufficient.
4. The cockpit layout does not allow the pilot the direct vision from either side of the aircraft which is necessary for this type of flying.
5. Fabric-covering is unsuitable due to its short life when exposed to the elements and contact with fertilizers, etc.
6. You suggest that the A.O.P.9 could be modified to an agricultural type. This would mean putting a hopper behind the pilot which would be undesirable from the forced-landing point of view. The hopper should be below the pilot.

In your Table of Aircraft the nearest approach to the type required appears to be the Fletcher F.V.24. You will note that this aircraft is being specially built for agricultural work in New Zealand.

It seems surprising that this country has not produced a specialized aircraft of this type as there have been numerous requests for many years and a wide market still exists. We feel that at least 1,000 of this type of aircraft could be sold in the British Commonwealth alone.

B. DILLON
St. Albans, Herts. B. V. DAVIS

The B.E.2 Series

SINCE your correspondent Mr. W. Armstrong has mentioned my letter, I feel that I would like to reply. First, I must comment on his amazing assertion that the D.H.6 was "an excellent trainer for the *ab initio* pilot." As one who instructed with these aircraft, I would suggest that, from Box-Kite to Tiger Moth, the "Clutching Hand" was quite the worst trainer!

The D.H.6 was more than merely stable, in that it "suffered fools gladly." And how! One of the first things to teach a pupil is that an aircraft requires airspeed, otherwise it will stall and probably spin. In spite of instruction, pupils (especially the over-confident variety) found that they could stagger round on these things at almost negligible airspeed, that the stall was innocuous and a spin virtually impossible; I shuddered to think what would happen to some of them when they graduated to, say, an Avro 504K or other excellent aircraft with which a pilot of little experience could not take such liberties with impunity. Certainly the D.H.6 was safe and ideal perhaps for joy-riding, but bad for preliminary training. One might just as well say that a vast desert is excellent for training a pupil to land; certainly he might make some fine landings there, but his training would be of little value if his next landing had to be made at an aerodrome like, for instance, Broxbourne!

Reverting to the B.E.s, I did not intend to give the impression that I found them difficult, but I dislike an aeroplane which does not respond rapidly to controls and I suppose that, in writing about the 2C and 2D, I was comparing them in my mind with such delights as the S.P.A.D. and little Bristol "Scout," which responded instantly to the slightest control movement. The B.E.2E was far better in this respect than the 2C or 2D.

I remember the flat-spin epidemic and have seen a 2E spun down to the ground, in this manner, with no damage to the pilot. I saw a 2E looped on one occasion, in spite of the "flimsy top-plane extension"; I was flying above it at the time in a similar machine and, knowing this was no occupation for a pupil, went down to trace the occupant—to find that he was that great pilot Frank T. Courtney!

Potters Bar, Middlesex. A. H. CURTIS.

Cost of the Boeing 707

IN regard to your remarks about the cost of the Boeing 707 I think it is only fair that certain points about tax should be cleared up. The maximum tax rate applicable to Boeing profits from which the prototype project had to be financed was, prior to 1954, 70 per cent rather than 82 per cent. The latter figure, referred to in the footnote on page 741 of the June 4th *Flight*, was published erroneously by an American trade magazine and subsequently corrected. Your information probably came from the same source. Subsequent to January, 1954, the rate is, as stated, about 48 per cent. To make the comparison proper would there not be some comparable tax rate applicable to de Havilland?

Further, I do not think it is quite fair to talk of research cost when other expenses are generally talked of in terms of "before-tax" cost. For example, if someone is paid a salary of, say, 10,000 dollars per year it is not customary to talk of that as 3,000 dollars cost "after tax." Also, the tax benefit only occurs if the company is otherwise making a profit.

Seattle, Washington. AMERICAN TAXPAYER.

Preserving a Real Spitfire

HOW pleasant it was at Coventry to see a genuine early mark of Spitfire of the Battle of Britain era flying again in its original war-paint. Nice as it is to see the later marks and the Seafires in the air from time to time, it is the Spits of the 1940 period which, together with the Hurricanes, really made history.

I have been told that this particular Mark 5, Service No. AB910, still carries honourable war wounds in its radiator cowling and that its R.A.F. form 700, which happily has been preserved, records a considerable history with several squadrons in wartime. In addition to its active service 910 still holds the world's speed record in its class and the British women's speed record.

Could not *Flight* use its good offices to make sure that this fine and, I believe, now unique machine is preserved for posterity when Air Commodore Wheeler has to part with it? Perhaps the original makers, who have shown interest in others among their many earlier products, might be persuaded to buy it and look after it. It has always seemed to me that veteran machines can be in no better hands than those of their originators. Examples of early cars preserved by Rolls-Royce and the representative fleet of aircraft maintained by Hawkers still look as good as the day they were built.

London, E.C.3. A. JENKINS.

Origins of the Mechanical Screen Wiper

I ENCLOSE a copy of a recent letter I wrote to Lord Hives in connection with the fiftieth anniversary of the meeting between the Hon. C. S. Rolls and Mr. F. H. Royce. In his answer Lord Hives says that he has recollections of the first windscreen wipers, but that the letter filled in a lot of interesting details. I have told the story to a good many people . . . and am wondering whether you would be interested.

[Extracts from Mr. Vokes' letter to Lord Hives follow.—Ed.]

. . . Perhaps the following story will interest you as my original business (C. G. Vokes and Co.) owed a great deal to your company in its early beginnings.

After being the chief engineer of the Alliance Aeroplane Company, one of the largest aircraft manufacturers in the first war, I was eventually the last to leave when the Company finally closed down in 1920 . . . I found myself a trained engineer with no hope of a position. I went to America and was fortunate in procuring the rights of the first automatic windscreen wiper which had ever been marketed. I returned to England and opened offices at 38 Conduit Street, London . . .

Whilst many people admitted the windscreen wiper was an ingenious mechanism, it seemed almost impossible to sell it . . . At this time there were a number of high-class cars regularly parked in the neighbourhood of Conduit Street, and I hit upon the idea of having suitable literature printed which I left in these cars as I passed by.

A few days later I received a visit from Lord Louis Mountbatten's chauffeur. . . . In due course Prince Louis' car was fitted. . . . Several weeks later your service manager saw the wiper operating . . . He opened the bonnet and traced the rubber tubing down to the suction side of the carburettor and immediately informed the chauffeur that by drilling a Rolls-Royce carburettor without permission the guarantee of the car had probably been broken. . . . I was told later that Mr. Royce himself spent a lot of time on the car at Derby and found that the wiper had done no harm, so the guarantee was restored. . . . The result of this was

that I received an enquiry from Rolls-Royce for two dozen Vokes-Folberth windscreen wipers at the then price of four guineas each, and from then onwards enquiries and orders followed.

Holybourne, Hants. C. G. VOKES.

P.R. Cameras

AS a very enthusiastic reader of your very excellent journal, I am taking this opportunity to query whether you are correct in your statement in the article on "Military Aircraft, 1954," under the section "Reconnaissance Aircraft," in which you state that a single F.24 camera is fitted to the Gloster Meteor F.R.9.

This is liable to give many people both at home and abroad a very wrong impression of this country's progress, as the F.24 is an obsolete camera, quite unsuitable for side oblique photography in a Meteor.

For some considerable time now Meteor F.R.9 machines have been fitted with the F.95 camera, developed for low-altitude photography, a fan of three cameras for port, starboard and forward being mounted in the nose of the aircraft, the pilot having full control of all three cameras.

These cameras have been mentioned in your journal on twelve occasions since the start of 1953, and are also in use with several friendly air forces in other countries.

W. B. HAKES

London, N.W.2

AIRCRAFT NOISE SUPPRESSION

A WRITTEN statement circulated by Mr. Duncan Sandys, Minister of Supply, in Parliament on June 28th shows the extent of the work now being carried out on the suppression of noise from aircraft engines of all types. Mr. Sandys said: "Aircraft noise, I well recognize, is becoming an increasingly serious and urgent social problem, to which some solution has got to be found and found quickly." A number of public organizations and universities are concentrating on the problem, and the aircraft companies themselves are also taking immediate steps to reduce noise nuisance from ground running. The financial allocation for this work for 1954 is, as the statement shows, 150 per cent up on that for 1953. Below, we publish in full the remainder of the statement:—

"The problem is being tackled from a number of different angles. The main effort has been concentrated on jet engines.

"A leading firm of engine-makers has been given a substantial contract by the Ministry of Supply to carry out an extensive programme of studies and experiments. This includes a detailed analysis of the noise of a jet engine operated with various alternative types of nozzle on an open-air test bed. The nozzles which are being tested include toothed, corrugated, convergent-divergent, and fishtail types. Promising results have been obtained from toothed and corrugated nozzles and further studies are being made to decide the optimum shapes for these types.

"Since it is known that the by-pass engine causes less noise than the conventional jet engine, a special study of the by-pass engine in relation to the noise problem is being carried out to determine the relationship between noise, jet velocity and temperature. The effect on noise of injecting water into the jet stream is also being investigated.

"Two other engine companies are working under Ministry of Supply contract on the development of silencers for piston engines used in helicopters. Some of the types of silencers which are being tested are showing encouraging results. Work is proceeding on the task of lightening the weight of these silencers and of reducing their adverse effect upon engine power.

"The Ministry of Transport and Civil Aviation is experimenting with the construction of a brick baffle wall at London Airport. This wall is shaped to accommodate the forward part of a large civil aircraft, with the object of reducing noise in certain directions when engines are being run on the ground. However, results are not yet entirely satisfactory and the investigation is being continued.

"After obtaining competitive tenders from appropriate firms, the Ministry of Supply has placed a contract for the design of two types of mobile ground mufflers. One of these is to be suitable for single-engined aircraft and the other for multi-engined aircraft. The first muffler of the single-engine type is expected to be ready for experimental testing in the course of the next few months.

"One firm of aircraft manufacturers has been experimenting with portable screens which are placed round the aircraft while the engine is being run up. Some reduction of noise has been obtained and further screens are on order. In addition, four other aircraft manufacturers are employing a firm of consulting engineers to advise them on the use of specially designed pens for muffling the sound of aircraft whose engines have to undergo running tests on the ground. Another firm, on its own initiative, is building a pair of mobile ground mufflers to its own design.

"In addition a series of tests are being carried out by the College of Aeronautics under contract from the Ministry of Supply. Southampton University, with some financial support from the Ministry of Supply, is carrying out valuable laboratory work with the object of obtaining a fuller understanding of the nature of jet flow. Manchester and Edinburgh Universities are also undertaking important fundamental research on the origin and nature of jet noise.

"Expenditure by the Ministry of Supply on this problem during the current financial year is estimated at about £100,000, compared with £40,000 last year. In addition the Ministry of Transport and Civil Aviation expects to spend about £20,000 on the study of this problem in the present year. Figures of expenditure by firms and universities on their own account are not available."

The whole subject of aircraft noise is much in the public eye —or perhaps it should be "ear"—at present. Particular attention has been directed to noise from helicopters, and this subject was discussed in our leading article last week. Many will welcome the news that experiments are in progress—with initially favourable results—with a view to silencing rotary-wing aircraft, although no details of this work, or of the firms involved, may yet be published. It would seem, however, that any silencing that can be achieved must refer to the engine and transmission, and Mr. Sandys did, in fact, specifically speak of silencing "helicopter engines," without mentioning rotor noise.

Readers desirous of following the subject further are recommended to our issue of June 12th last year, in which was published a full summary of a most informative symposium on aeronautical acoustics (from all aspects) held jointly by the Royal Aeronautical Society and the acoustics group of the Physical Society. Particularly appropriate, in view of the Minister's statement, was the paper by Mr. F. B. Greatrex of Rolls-Royce, in which was discussed most of the work carried out on jet-nozzle noise up to that time (Rolls-Royce would clearly seem to be the "leading firm of engine-makers" referred to in Mr. Sandys' statement).

This company are by no means able to give full details of the most interesting work which they are doing in this sphere, but it can be said that they are dividing the work into three main branches: the damaging effect of jet blast on local portions of aircraft structure, the effect of jet noise on people in the immediate vicinity of aircraft, and the character of air-to-ground noise as jet aircraft pass low overhead; principal attention is being paid to the first two problems. Further, it can be said that the company has various forms of sound-reducing jet nozzle in a fully developed state; and throughout the development of these nozzles, strict limits have been placed on the acceptable effect upon thrust and specific fuel consumption, and the company are able to state that their nozzles can already reduce the noise from a given turbojet by from six to eight decibels, without any performance penalty. Regarding the by-pass type of engine—of which the Conway is the only example known to be running—Rolls-Royce have found that, largely owing to the lower mean jet velocity, it runs approximately eight decibels quieter than does a modern axial turbojet of equal thrust.

No details may yet be given of the mobile sound-reducing devices referred to by the Minister, but it is likely that their development is in the hands of the two principal companies engaged in aero-engine acoustic engineering: Detuners, Ltd., of London, N.19, and Cementation (Muffelite), Ltd., of London, S.W.1. Both these firms are well known for their silencing equipment for engine test beds, and full descriptions of these installations were published in our issues of September 5th, 1952, and December 12th, 1952, respectively.

FORTHCOMING EVENTS

July 8-12. British Institution of Radio Engineers: Industrial Electronics Convention, Oxford University.
July 9. College of Aeronautics: Annual presentation day and ball, Cranfield.
July 10. R.N.A.S. Brawdy: Air Day
July 10. R.N.A.S. Lossiemouth: Air Day.
July 10-11. International Radio Controlled Models Society: Annual contests, Birmingham.
July 10-12. R.Ae.C. members' La Baulle rally.
July 17-24. International Gliding Exhibition, London.
July 18-25. Aero Club of Italy: International air week.
July 20-Aug. 4. B.G.A.: World Gliding Championships, Gt. Hucklow, Derbyshire.
July 24-26. World Model Aircraft Championships and Wakefield Trophy, Washington, U.S.A.
Aug. 9-11. Institute of the Aeronautical Sciences: Conference on turbine-powered air transport, Seattle, U.S.A.
Sept. 7-12. S.B.A.C. Farnborough display and exhibition.
Sept. 9-12. Royal Aero Club: International invitation air rally, White Waltham.

CIVIL AVIATION

VISCOUNT-CONVAIR COMPARISON

AN interesting comparison between the Viscount 701 and the Convair 340, based on the most realistic figures obtainable, is published in the June *B.E.A. Magazine*. The Corporation's chief executive, Mr. Peter Masefield, quotes the following figures as an indication of why the Viscount has been gaining so many orders recently. Incidentally, the three Series 744 48-seaters ordered by Capital Airlines for delivery early next year will be those originally destined to be B.E.A.'s 24th, 25th and 26th Viscounts.

	Viscount 701	Convair 340
Number of passenger seats ...	47	44
Normal cruising speed	306 m.p.h.	253 m.p.h.
Normal cruising height ...	17,000ft	10,000ft
Normal cruising horse power ...	3,724 e.h.p.	2,400 b.h.p.
Payload for 600 miles international sector	10,674 lb	10,350 lb
Reserve fuel for 600 mile sector	4,688 lb	1,499 lb
Gross weight	57,000 lb	47,000 lb
Aircraft (direct) operating cost for 600 mile sector	£203	£207
Operating cost per aircraft mile for 600 mile sector	6.74 shillings	6.90 shillings
Revenue for 600 mile sector at 65 per cent load factor ...	£511	£479
Surplus of revenue over direct operating cost for 600 mile sector	£308	£272
Block time for 600 miles ...	2 hr 23 min	2 hr 45 min

DECCA RADAR SYSTEMS

IN addition to their marine equipment, Decca Radar, Ltd., now handle a wide field of other radar activities, including military systems, civil air aids, radar links and meteorological radar. All these latter activities now come within the scope of the company's new radar systems division, to be headed by A. Cdre. Michael Watson, C.B., C.B.E., assisted by Mr. S. J. Kyte.

A. Cdre Watson, who retires from the R.A.F. at his own request to take up this appointment, joined the Service in 1929, and for the major period of his career specialized in signals duties. At the outbreak of the war he was Chief Signals Officer, No. 5 Bomber Group. Subsequently he held appointments at Air Ministry and in 1944 became Deputy Chief Air Signals Officer of S.H.A.E.F. In 1950 he was posted as Command Signals Officer, Fighter Command, under Air Chief Marshal Sir Basil Embry, and from then until 1953 played a major part in planning Britain's post-war fighter defence systems.

Since 1953 A. Cdre. Watson has been Director of Signals, Air Ministry. Throughout his Service career he has continued active flying, including jet fighters and transport aircraft.

A. Cdre. Michael Watson, C.B., C.B.E.

FOR JAPAN: This Marathon, first of two for Far East Air Lines, will shortly enter service on Japanese domestic routes. It was handed over last week at Woodley by Sir Frederick Handley Page to Admiral Nakamura; both are seen (right) sampling the comfort of the 20-seat cabin.

JAPANESE MARATHONS

THE first of two Marathon feederliners for a new Japanese airline was formally handed over by Sir Frederick Handley Page at Woodley, Reading, on June 29th. It was accepted on behalf of the operator, Far East Air Lines, by Admiral Todomu Nakamura, aviation manager of C. Itoh and Co. This Company acts as Handley Page's agents in Japan, and is also understood to have a majority holding in the new airline.

Before handing over a key to the aircraft, together with its C. of A., Sir Frederick expressed pleasure at Japan's re-entry into the field of civil aviation, recalling such pre-war relationships as the Mitsubishi licence for his own company's slotted wing. He noted that the Marathon was the largest British airliner yet sold to Japan. Admiral Nakamura said that the Marathons would be used from the end of this month on a Japanese internal route—between Osaka and Fukuoka [a distance of about 290 miles]. Next year Far East Air Lines hoped to extend their network as far south as Okinawa. He forecast a good reception for the new aircraft from the Japanese travelling public.

Temporarily carrying the British registration G-AMHY, the Marathon is a brand new aircraft, attractively finished with a white top, fuselage flashes in dark and light blue and the Japanese flag on the outer fins. Its companion aircraft, externally complete, stood nearby at Woodley. Both machines are being flown out to Japan in easy stages, and the first, piloted by Capt. H. G. Holmes, operations manager of F.E.A.L., will leave shortly.

Although the Japanese Marathons are equipped to carry 20 passengers, instead of the standard 18, the Rumbold interior is remarkably spacious. The gangway is reasonably wide and legroom is quite generous by comparison with the tourist-class interiors of many larger aircraft. The 20 seats are arranged in pairs—four on the port side and six on the starboard. Freight and baggage are loaded into a rear compartment through a special door on the starboard side, aft of the toilet. The interior colour-scheme is light blue and cream.

F.E.A.L. will operate with a crew of two pilots plus stewardess. Radio equipment is all of S.T.R. manufacture, consisting of A.D.F. receiver, V.H.F. transmitter-receiver, H.F. transmitter and H.F. receiver.

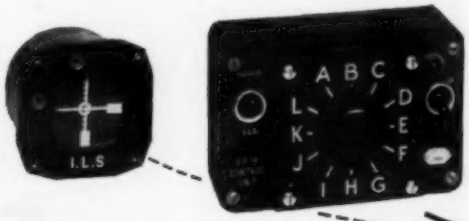
Although the Handley Page (Reading) factory at Woodley is still working on the batch of Marathon crew-trainers for the R.A.F., it is unlikely that there will be any further production of civil versions. The company's next airliner will be the H.P.R.3 Dakota-replacement, with four Leonides Majors of 870 h.p. A full-size mock-up of the H.P.R.3 was to be glimpsed in the hangar where the Marathon ceremony took place, though on this occasion it was shrouded in tarpaulin and visitors were denied access. Nearby was a newly built fuselage section, hinting that construction of a prototype is under way.

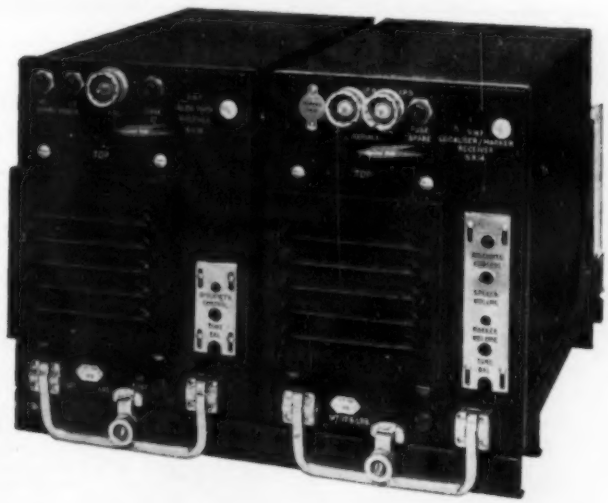
Standard

in the

VISCOUNT

Instrument Landing System receivers





Type SR 14B/15B

Suitable for use in Civil or Military Type Aircraft

This equipment fully complies with the requirements of the International Civil Aviation Organisation.

Write for Radio Leaflet No. 186/19

AVAILABLE FOR EARLY DELIVERY

Standard Telephones and Cables Limited

Registered Office: Connaught House, Aldwych, London, W.C.2

RADIO DIVISION · Oakleigh Road · New Southgate · London, N.11

WE ARE A.I.D. AND A.R.B.
APPROVED STOCKISTS

ALUMINIUM
and
ALLOYS

W. Wilson & Sons (LONDON) *Ltd.*
Registered Office: 3, Challont Road, N.7
Works: 6, Sheringham Road, N.7
Telephone Nos. North 4476/7/8 & 2546

AEROPLANE
AND ENGINE
COMPONENTS

AND
GEARS

S. E. OPPERMAN LTD.
Stirling Corner (A.1. Route), Boreham Wood,
Herts., England. Phone: Elstree 2021

Jubilee
The Finest Clip in the World

Make SURE its a genuine Jubilee!

L. ROBINSON & CO. (GILLINGHAM) LTD.
London Chambers, GILLINGHAM, KENT. Phone 5282

CIVIL AVIATION . . .

THIRD RUNWAY FOR FIJI

CONSTRUCTION of a third runway at Nandi airport, on Fiji, was discussed at Melbourne last week at a meeting of the South Pacific Air Transport Council. Delegates from Britain, Canada, Australia, New Zealand and Fiji are attending the meeting, which was opened on June 28th by the Australian Minister for Civil Aviation, Mr. Anthony.

Mr. Anthony said on Monday that the construction of a third runway at Nandi had been contemplated for a long time. It was important, he said, that a decision be taken on the matter. Mr. Anthony spoke with regret about the disappearance of flying-boat services on the trans-Tasman crossing between Sydney and New Zealand (Solents were replaced by DC-6s on June 28th).

SUPER CONNIES FOR SPAIN

THE first of three Super Constellations for Iberia, the Spanish national airline, was formally handed over to the company in New York on June 23rd. The other two aircraft are due to be delivered this month. All will bear names commemorating Columbus's expedition to the New World in 1492: the flagship is named *Santa Maria*, and the other Super Constellations will be called *Nina* and *Pinta*.

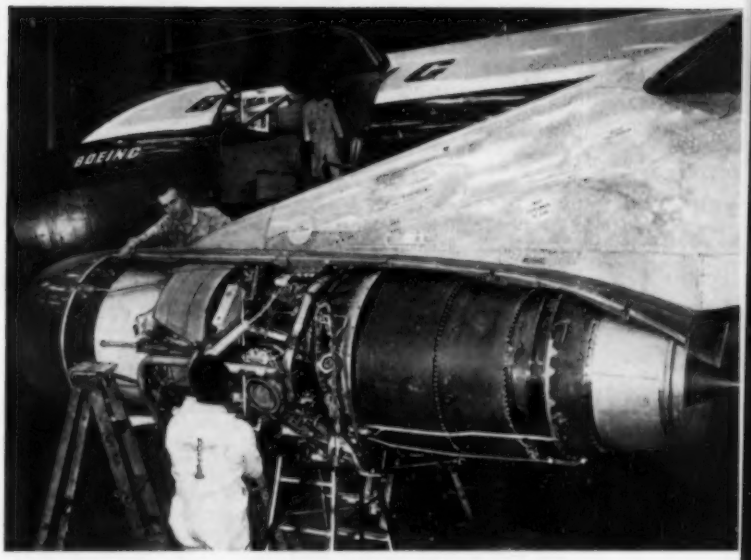
Destined for transatlantic service between New York (when the necessary bilateral agreement has been negotiated), Iberia's new airliners will carry a crew of 11 and 59-63 passengers. We rather like Lockheed's description of the aircrafts' furnishings: "An entirely new note in air travel is incorporated in the new Iberia airplanes whose interior reflects Spanish culture and taste. The cabins are adorned with handwoven draperies and antique Cordovan leather. Developed by Henry Dreyfuss, famous industrial designer, the interior combines deep greens, off-white and light greens with pomegranate red. Nine partitions are built into the aircraft for maximum privacy."

TWO-MAN VISCOUNTS

UNLIKE B.E.A.'s Series 701s, the four Viscount 707s now in service with Aer Lingus were equipped from the outset for operation by a two-man crew. The cockpit layout, illustrated for the first time on this page, features an overhead panel for radio remote control, bringing dual V.H.F., H.F./M.F., dual A.D.F., I.L.S. and intercom. within the control of either pilot. The master control for the public address system is mounted on the captain's side only.

Below the radio panel is an auxiliary panel carrying airscrew and engine de-icing switches and indicators, airframe de-icing switches and temperature indicator lights. This panel also carries the generator ammeters, main breaker trip-and-reset switches, master voltmeter and selector switch. On the captain's side of the panel are the water-methanol pump switches, navigation lights switch and passenger sign switches. This panel occupies the position given to the Decca Navigator in Type 701 Viscounts. The lower panel carries dimmers for the panel lights and also for the control pedestal lights.

UP FRONT in an Aer Lingus Viscount (description above).



PODDED: An informative close-up of one of the four P. and W. J57-type turbojets provided for the Boeing Stratoliner/Stratotanker prototype. The civil versions of these 10,000 lb units will be known as JT3Ls. Boeing informed us recently that the primary structure of the new prototype was not damaged by the recent taxying accident, and that the first flight was scheduled for around mid-July.

FRANCO-SOVIET AIR AGREEMENT

IT was announced in Paris last week that the French and Soviet Governments had reached agreement on the opening of a regular air service between Paris and Moscow. The service will not be direct: Aeroflot will carry passengers as far as Prague, and the Prague-Paris stage will be flown by Air France. Initial negotiations leading to the agreement began three months ago, when M. Javoronkov, head of Aeroflot, visited Paris. M. Max Hymans, president of Air France, left recently on a reciprocal journey to Moscow.

NEW PREMISES FOR I.A.L.

OCCUPYING an area of 25,000 sq/ft, new premises at Hayes Road, Southall, were taken over by the engineering division of International Aeradio, Ltd., on June 30th. The official opening ceremony was performed by the Earl of Birkenhead. The move from Bovingdon of I.A.L.'s engineering division has the effect of centralizing the work of the company, which has a well-equipped printing and publishing section already operating at Southall. I.A.L. was formed in 1947 by the major international airlines and now operates aeronautical communications, air traffic control services and allied aids at over 50 stations throughout the world.

An idea of the work of the engineering division is given by a brief description of some items of equipment shown to visitors after the opening ceremony at Hayes Road. Exhibits included: (1) A radar trainer (shortly to be shipped abroad for the Government of Pakistan) which produces synthetic echoes on a radar screen and can simulate four aircraft flying in a given area at the same time. Similar to the M.T.C.A. trainer at Hurn, the equipment enables ground radar operators to be trained without the need to work in conjunction with operational aircraft flying at a considerable cost per hour. (2) A radio teletypewriter receiving terminal, specially developed in conjunction with the Plessey Company for the reception of frequency-shift keying RTT transmissions. (3) A frequency counting equipment, consisting of a frequency counter produced by Cinema Television, Ltd., whose frequency range has been extended by I.A.L. The equipment can measure the frequency of a crystal to a far greater accuracy than methods normally in use and has, therefore, valuable application in these days, when the number of radio frequencies in use is growing daily. (4) Prefabricated stations; these are compact units consisting of transmitters, receivers, and allied equipment of various manufacturers engineered into a complete system. The I.A.L. prefabricated station (those shown were for Indonesia) shows particular emphasis on operational flexibility and installation simplicity for world-wide application. (5) Two-tone V.H.F. radio teletypewriter, specially developed by International Aeradio for operation over short distances in countries where land-line facilities are either not available or difficult to maintain.

CIVIL AVIATION . . .

FIRST OF MANY landings to be made at Ferryfield by Bristol 170s was performed last week by G-ANWG, itself the first of three new Superfreighters for Silver City Airways. The airport is now expected to come into operation on July 14th, the sixth anniversary of the company's cross-Channel ferry.

COMET TESTS: OFFICIAL STATEMENT

AN interim statement on the progress of tests on the Comet 1 aircraft was made to the House of Commons on July 5th by Mr. Duncan Sandys, the Minister of Supply. He said that the technical examination of the Comet by the Royal Aircraft Establishment at Farnborough was making good progress. Wreckage recovered from the sea near Elba had been most thoroughly examined and an intensive programme of trial flights and experiments had been carried out on Comets withdrawn from service.

In particular, the wings, tail and main structure had been tested for metal fatigue and for possible weaknesses. The strength of the pressurized cabin had been extensively tested and trials had been carried out to discover whether excessive pressure might have been built-up in the tanks from the use of high pressure fuel pumps. These and other tests were still proceeding. It would be premature to announce the results obtained. When the investigations were completed all information would be submitted to the Court of Inquiry.

Meanwhile, the manufacturers were being kept fully informed so that they might consider what modifications might be necessary. Replying to Mr. George Strauss, who had asked whether some indication might be given as to when the tests were likely to be completed, Mr. Sandys said that he was hopeful it would not be too many weeks more—just how many he was not prepared to say. These investigations were still going on and he would prefer not to speculate in any way about the results which would emerge. But nothing had emerged which caused him to be less optimistic about the outcome than before.

WELSH PIPELINE SURVEY

USING an S-51 helicopter chartered from Westland Aircraft and piloted by John Fay, the chairman and the distribution engineer of the Wales Gas Board made a three-hour flight on June 22nd to survey the route for a 130-mile pipeline between Maelor, Wrexham, and Shotton, Chester. The distribution engineer said that the flight had done in hours what would have taken weeks by any other method; it had been possible to view the whole route of the proposed pipeline, and to assess its suitability on both technical and aesthetic grounds.

TROOPING BY AIR CHARTER

IT is announced that Air Charter, Ltd., of Stansted and Southend, have won a 50 per cent share of the Government contract for trooping to the Canal Zone. This will entail an average of one flight daily in each direction throughout the 12-month period from August 1954. Air Charter state that they are now undertaking the largest portion of Government trooping with their fleet of Yorks. The company entered the trooping field in April last year with a contract entailing a fortnightly flight to Fiji, and last May it obtained a contract for carrying troops to West Africa.

BREVITIES

IN pre-war days a traffic officer with Imperial Airways, Mr. A. Laurence Young has been appointed secretary of I.A.T.A. He succeeds Mr. J. A. MacD. Henderson, who recently resigned.

* * *

B.E.A. coaches travelling to Waterloo Air Terminal from L.A.P. or Northolt are now permitted by the licensing authority to set down passengers in Cromwell Road, near Gloucester Road Underground Station.

* * *

The M.T.C.A. has produced a pamphlet surveying accidents to aircraft in the United Kingdom during the calendar year 1952. Accidents are classified under the following headings: apparent cause; type of accident; phase of operation; nature of flight and degree of injury sustained. The pamphlet is obtainable from the Stationery Office at 1s 6d.

* * *

Unspecified "aerodynamic refinements" to the ten L.1049 Super Constellations operated by T.W.A. will give these aircraft a 10 m.p.h. increase in cruising speed. The airline is believed to have pressed for the extra performance as a result of American Airlines' better schedules with DC-7s on competitive coast-to-coast services.

* * *

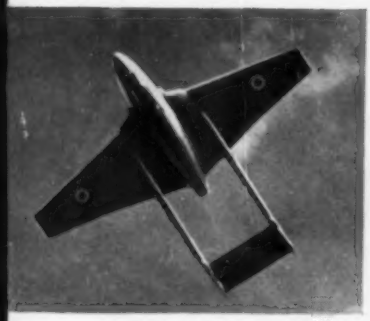
In reply to a recent Parliamentary question, Mr. A. T. Lennox-Boyd, Minister of Transport and Civil Aviation, said that the capital cost of London Airport up to March 31st was approximately £19m, plus about £1.5m for the purchase of land and certain costs outside the airport. Mr. J. Profumo, replying to another question, gave an estimated figure of £6m for the first stage of developed Gatwick Airport. The annual cost, including all technical services but excluding capital charges, would be £350,000 and the estimated annual revenue was £400,000. In addition, savings at other London-area aerodromes affected by the Gatwick project were estimated at £450,000 per annum.

SPADEWORKERS: World airline fares for 1955 will be established by the I.A.T.A. traffic conference at Venice in September. Meanwhile, preliminary discussions are being held in Montreal by the I.A.T.A. cost committee, portrayed here:
(Seated) R. Bouvatier, Air France; J. Dillenbeck, S.A.S.—vice-chairman; J. B. Scott, B.O.A.C.—chairman; E. S. Pefanis, I.A.T.A.—secretary; A. van Putten, K.L.M. (Second row) J. Bertucat, Air France; Paul C. Brabant, Sabena; J. D. Wayte, B.O.A.C.; Paul C. Velte, Jr., P.A.A.; C. A. Herring, B.E.A.; H. E. Shenton, I.A.T.A. (Third row) N. E. Taylor, T.C.A.; Leo Bollhalder, Swissair; A. Torres Garcia, Aerolineas Argentinas; F. A. Kane, P.A.A.; Donald Kittelberger, T.W.A.

GAMECOCK and PEREGRINE AT HOME

Fleet Air Arm Displays at Bramcote and Ford

"FLIGHT" photographs



The Vampire at "Gamecock."

EVEN when—as at R.N. Air Stations Ford and Bramcote last Saturday—the British summer is at its perverse worst, Naval Air Days attract big crowds. Experience of previous years has taught them that, given anything but "zero-zero" weather, the Navy can be relied upon for a first-rate air display. Bad-weather flying means precise flying, and precision is perhaps the dominant theme on these occasions. It is expressed not only in the air but in the visual pattern of the stations themselves—the trimly cropped grass, clean roads, neat buildings, smart Naval turnouts and perfectly aligned aircraft, glossily finished in the colours of the sea.

At Saturday-noon Bramcote's wardroom lawn was deliciously garnished with salmon and chicken, salad and strawberries, and subtle gin-drinks in the best Naval manner. The guests were fast warming to the charm of the occasion—then down came the rain. But not for nothing is the station called H.M.S. *Gamecock*, and there was no sign of retreat even when pleats began to wilt from best bibs and tuckers. Only when the level of the White Lady jugs began to *rise* was a fighting withdrawal authorized.

At length we buffeted a way through the squalls to the "static" hangars, wherein the aircraft had already been so dented in the line of duty that clambering was actually encouraged. By now a little of our own *Gamecock* spirit had evaporated, and we heard with satisfaction that the met. officer had been sacked. We were settling in for a good afternoon's mope when the sun began to smirk covertly, the met. officer was publicly reinstated, and nearby coughing and sneezing of starters proclaimed that Nos. 1844 and 1833 Squadrons were about to do their stuff in their Fireflies and Sea Furies. A picture shows how well they did it. Their stream-landing completed, a Provost from Syerston (where the Navy's pilots are trained by the R.A.F.) leaped up from the grass like a partridge and happily belied the commentator's assurance that "it was not allowed to do aerobatics."

As commanding officer of No. 1833 Squadron, Lt. Cdr. Woodhead did not allow such trifling matters as pendulous black clouds to mar his fast and furious aerobatic performance. It's a way they have in the Wavy Navy, and we hope that the Lt. Cdr. went back well content to his bread-and-butter job with Airwork.

Four aerobatic Sea Hawks, led by Lt. Cdr. Morison, now came flashing across from Brawdy, Wales. That the showmanship of the squadron concerned equalled the airmanship of its pilots was evident when, for a finale, the fighters whispered along the enclosures in tight formation, with wheels and flaps down, then suddenly flipped out their arrester hooks in unison. Too bad that the squadron was proclaimed as 806 instead of 898; too bad, in fact, that the whole commentary had to be "breezy" at the expense of accuracy.

Com. Plt. Cox having been tugged aloft in his Grunau Baby, visitors were invited to switch off their car engines (no doubt having kept them running to prevent freezing up), in order to appreciate his graceful manœuvres. And though the ensuing hush was rudely broken by a Viking on its base commercial passage overhead, Mr. Cox's fancy gliding was not in vain. Another commissioned pilot—a Mr. Darlington—demonstrated with impressive effect the qualities of an Attacker from the Naval Air Fighting Development Unit, West Raynham. Mysterious underwing appendages are shown on page 64. Equally edifying was the helicopter act by a Whirlwind and a Hiller, wherein the Hiller especially distinguished itself by cutting dervish-like capers and autorotating in the most off-hand manner.

A happy notion, or accident, caused the R.A.F. to send the aerobatic flight of No. 43 Squadron down from Leuchars, for 43 (as faithful readers know well) is the Fighting Cocks Squadron. Under the leadership of F/L. Walker its representatives did everyone proud.

A distant detonation earlier proclaimed that F/Sgt. Capp was sharpening his Benson-based Sabre, which proceeded to slash the neighbouring sky into ribbons, though one could hardly credit the declared fly-past speed of 650 knots.

The Tiger Moth dinner plate-shooting chestnut having been played out to its time-honoured conclusion, a Vampire aerobatic display was announced; and though this knowledge may not stir the reader's breast, the show was terrific. Lt. Brown of 809 please take a bow; likewise Messrs. Witteridge and Griffiths of Armstrong Siddeley for showing once again that the Blackburn Y.B.1 and Mamba/Viper/Merlin-Lancastrian are as suitable for demonstration flying as for engine development. A picture of the Y.B.1 shows the "pillar-box" slots.

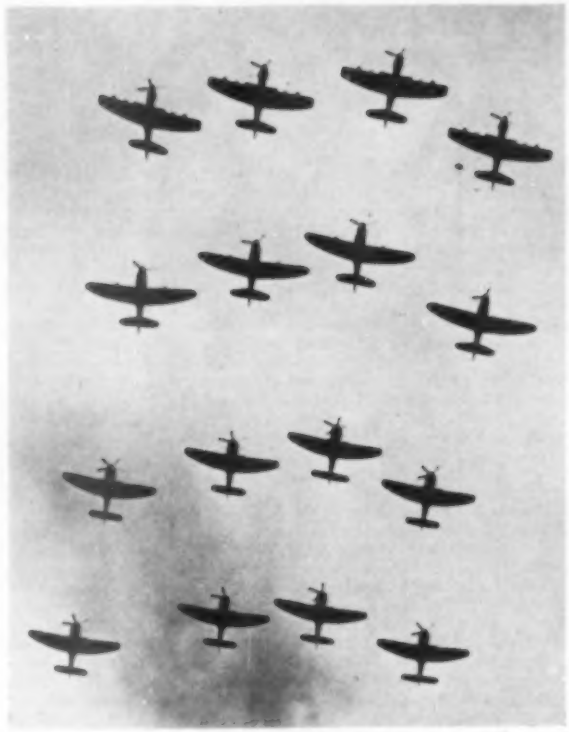
The final set-piece events were to have included a mock attack on the airfield by parachutists of the 16th Airborne Division, dropping from a Hastings; but the Hastings having been detailed for a pressing operational commitment in the service of Transport Command, the Sea Furies and Fireflies took the air again to shoot up the prescribed targets with very satisfactory effect. Meanwhile, an assault party landed by the willing and capacious Whirlwind dashed into and out of action with becoming earnestness.

Peregrine

At Ford (Capt. L. E. D. Walthall, D.S.C.) the nautical atmosphere was strong, literally so, at 1430 hr, when flying was due to begin. A wind of 20 kt was gusting in from the nearby English Channel, bringing with it a salty drizzle which obscured even the surrounding fields. But fortunately the rain was short-lived (though the cloud-base remained at less than 1,000ft), and when he could see the tall radar pylons at Poling, some three miles to the east, Commander (Air) gave the signal for action. According to the controller's programme, this was to be "Hk. Stream T.O." by "20 Hk. 802, 804, 898"—which, being interpreted and performed to plan, meant a mass departure and fly-past by Sea Hawks of both resident and visiting squadrons. A box of four, representing 898 Squadron, demonstrated formation flying fast and slow with magnificent disregard for another sharp shower which cut visibility almost to the dimensions of the airfield; this fine performance was concluded with a box landing.

Ford, otherwise H.M.S. *Peregrine*, is the base for no fewer than three operational squadrons (whose parent carrier is now "along-

Armstrong Siddeley's Double-Mamba-powered Blackburn Y.B.1 and one of the Navy's new Hiller H.T.1s distinguishing themselves at Bramcote.



Battle formations at Bramcote and Ford: (left) eight Fireflies and eight Sea Furies of the Midland Air Division, comprising Nos. 1844 and 1833 Squadrons; above are eight Wyverns of No. 813 Squadron, based at Ford.

GAMECOCK AND PEREGRINE AT HOME . . .

side" in her home port), two R.N.V.R. squadrons, two more R.N. squadrons, an experimental unit and the Navy's School of Photography. The flying programme reflected most impressively the diversity of the station's tasks and equipment.

There was a further stream take-off by Sea Furies of No. 810 Squadron (Lt. Cdr. H. J. Abraham), and a dive-bombing demonstration to illustrate the squadron's primary rôle of ground attack —which, incidentally, it practiced in Korea with Fireflies. Six of these veteran two-seaters demonstrated a jet-assisted take-off, performed by pilots of the Channel Air Division, R.N.V.R. (Cdr. N. H. Bovey, D.S.C.).

A multi-purpose Ford unit is No. 703 Squadron (Lt. Cdr. J. R. N. Gardner, D.S.C.), the Service Trials Unit, whose present equipment now includes the first of the Navy's new Gannets. Responsibility for proving the Gannet in its operational rôle rests with No. 703X Flight, under Lt. Cdr. F. E. Cowtan, who flew one of the two demonstrated on Saturday.

Apart from its undoubted value as an anti-submarine weapon, the portly, bustling Gannet is an excellent showpiece. It has an impressive speed range and an interesting variety of configurations, stemming from its ability to fly with one Mamba-driven airscrew feathered, bomb-doors open and radome extruded; at Ford, we particularly liked one very slow fly-past, three silver-helmeted figures plainly visible behind their respective Perspex enclosures. By comparison, the mighty Wyverns of 813 Squadron (Lt. Cdr. C. E. Price, A.F.C.) all but dwarfed their pilots. Eight of these versatile strike aircraft flew across in tight "finger-four" grouping; one, piloted by Lt. Hedges, provided the first aerobatics of the day, its wing-tips leaving twin streams of condensation in the humid air.

Lt. Kelly of 898 Squadron satisfied the most critical occupants of the enclosures with a brilliant show of Sea Hawk aerobatics. Some, perhaps, were a little unnerved by the lower half of a tight, low loop. Equally smooth and skilful in a totally different way were Lt. Cdr. Sproule's evolutions in a white Olympia sailplane, launched into the gusts by a Tiger from Gosport.

We record with pleasure that, just this once, *no* helicopter rescues were enacted at Ford. Instead, two S-51s took part in one of the most oddly diverting acts seen at an air display by lifting (a) an orange-painted bicycle with an airscrew forward and stabilizing fin aft and (b) a magic carpet, also suitably stabilized. These devices were piloted respectively by a top-hatted leading airman and a petty officer, naked save for a loin cloth.

The commentator, Cdr. Callingham, next drew our attention to the centre of the airfield, where members of the 344th Sussex Yeomanry were to be seen deploying Bofors guns in preparation for attack. The raiding force, requiring half the runway for positioning before take-off, consisted of six Avengers (815 Sqn), 11 Fireflies (Channel Air Division), 12 Sea Furies (810 Sqn), nine Wyverns (813 Sqn) and 14 Sea Hawks (802, 804 and 898 Sqns). Their onslaught was a magnificent affair—full of fire, smoke, sound and speed. Even the staccato Bofors, firing break-up shot, could scarcely be heard above the roaring of Cyclones, Griffons, Centaurus, Pythons and Nenes.

By now the clouds had broken up, providing a brightly-lit stage for the last act—formation aerobatics by a team of four 804 Squadron Sea Hawks, led by Lt. Cdr. E. M. Brown, who has now been flying Naval jets for nearly ten years. The formations then returned to the airfield and peeled off smartly for a stream landing. For those who lingered at this point there was a final demonstration—a fast, furious circuit by a single Wyvern. Still airborne when all his shipmates were on dry runway, he had been baulked first by a Sea Fury and, next time round, by a Firefly. Fortunately, perhaps, there was no connection between the R/T. and the public address system . . .

Fords' flying bicycle (left) was powered by a Dragonfly and manned by Leading Airman McAllister, who earned the respect of the crowd.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Technical College Commandant

AFTER having been with the British Joint Services Mission, Washington, for technical duties since April 1951, A. Cdre. C. L. Dann, O.B.E., is to become Commandant of the Royal Air Force Technical College, Henlow, next month.

From December 1937, until October 1942, A. Cdre. Dann was on the armament staff of the Aeroplane and Armament Experimental Establishment, after which he spent two years at M.A.P. In February 1945, he became Officer Commanding, R.A.F. Station, Thorney Island, and in June 1946, went to the Air Ministry for duty in the Directorate of Operational Requirements. From 1948, until going to Washington, he was with the Ministry of Supply in the Rocket Propulsion Department.

Canada's V.C.A.S.

COMMANDANT of the National Defence College, Kingston, for the past three years, A.V-M. C. R. Dunlap, C.B.E., has been appointed Vice-Chief of the Air Staff, succeeding A.V-M. F. R. Miller, who is to become Chief of Staff to General Lauris Norstad, Air Deputy at the Supreme Headquarters Allied Powers Europe.

A.V-M. Dunlap's appointment will take effect early next month.

New Anti-Aircraft Frigate

THE first of a new type of anti-aircraft frigate, H.M.S. *Puma*, was launched on June 30th at the Greenock yard of Scott's Shipbuilding and Engineering Co., Ltd. The naming ceremony was performed by Mrs. Simon Wingfield Digby, wife of the Civil Lord of the Admiralty.

Puma is a ship of 340ft extreme length (330ft between perpendiculars) and she has a beam of 40ft. She is armed with four 4.5in guns and has two additional guns and a "Squid" anti-submarine mortar.

These new anti-aircraft frigates are designed primarily for convoy protection.

FOR THE ANTIPODES: At Wig Bay, Stranraer, on June 29th the last of 16 Short Sunderlands reconditioned for the Royal New Zealand Air Force was officially handed over. It is shown, in the act of proving that there is still much life in the old type yet.

Medelex B

AN Allied exercise code-named Medelex B will take place in the Eastern and Central Mediterranean between July 19th and 23rd. The exercise will be a two-sided manœuvre in which naval units of France, Italy, Greece, Turkey, United Kingdom and United States, together with maritime patrol air elements of the United States Navy, Royal Air Force and Italian Air Force, have been allocated to either "orange" or "blue" forces.

Orange forces will be controlled by the commanders of the Central and Eastern areas, Admiral Girosi from Naples, and Admiral Lappas from Athens respectively, carrying out their normal area command functions within their respective zones. Blue forces will be deployed in opposition by Commander North Eastern Mediterranean, Admiral Altincan.

The exercise will be under the overall direction of Commander-in-Chief, Allied Forces Mediterranean, Admiral the Earl Mountbatten of Burma, whose Malta Headquarters prepared the planning directive for Medelex B.

The exercise will include the defence of convoys against submarine, surface and air attacks, mining and mine countermeasures, and amphibious operations. By reducing to a minimum the pre-planned aspects of this exercise and establishing only certain broad principles, the maximum number of opportunities will be provided for the exercise of initiative by Commanders ashore and afloat.

WAIT FOR IT: A crew member with poised pistol stands ready to fire the signal for the power launch of the 16th Sunderland for the R.N.Z.A.F. Cutting the tape is A. Cdre. M. F. Calder, C.B.E., A.O.C., R.N.Z.A.F. H.Q. London.

Half-Yearly Promotions

THE following half-yearly list of promotions has been issued by the Air Ministry. In it are included a number of Acting Air Vice-Marshals who are confirmed in their rank. These are: J. L. F. Fuller-Good, C.V.O., C.B.E., A.O.C., No. 22 Group; W. J. Crisham, C.B., C.B.E., A.O.C. No. 12 Group; J. N. T. Stephenson, C.B.E., S.A.S.O. at M.E.A.F.; P. D. Cracroft, C.B., A.F.C., S.A.S.O. at H.Q. Coastal Command; S. R. Ubee, C.B., A.F.C., Director-General of Personnel (2); H. D. McGregor, C.B., C.B.E., Director of Guided Weapons, Technical Development, M.o.S.; and F. J. St. G. Braithwaite, C.B.E., A.O.C. No. 61 Group. A. Cdre W. M. L. Macdonald, C.B.E., D.F.C., A.O.C. Singapore, also becomes an Air Vice-Marshal.

Group Captain to Air Commodore: H. F. G. Southey, C.B.; L. E. Jarman, D.F.C.; E. J. Corbally, C.B.E.; C. S. Moore, O.B.E.; E. S. Butler, O.B.E.; A. E. Clouston, D.S.O., D.F.C., A.F.C.; N. C. Hyde, C.B.E.; G. A. Walker, C.B.E., D.S.O., D.F.C., A.D.C.; H. J. Kirkpatrick, C.B.E., D.F.C.; V. D. Morshead and R. C. Storrar, O.B.E.

Wing Commander to Group Captain: A.

SERVICE AVIATION . . .

R. D. Macdonnell, D.F.C.; J. D. T. Revell; M. P. C. Corkery, A.F.C.; A. C. Brown, D.S.O., O.B.E., D.F.C.; C. B. E. Burt-Andrews; D. H. Burnside, D.S.O., O.B.E., D.F.C.; G. F. Rodney, D.F.C., A.F.C.; J. B. Russell, D.S.O.; R. C. Love, D.S.O., D.F.C.; P. E. Warcup, O.B.E.; C. D. Milne, O.B.E., D.F.C.; G. Lowe, D.F.C., A.F.C.; M. W. B. Knight, D.F.C.; D. C. Torrens, O.B.E.; S. G. Wise, C.B.E., D.F.C.; P. Burnett, D.S.O., D.F.C.; R. W. Cox, D.S.O., D.F.C., A.F.C.; F. W. Thompson, D.S.O., D.F.C., A.F.C.; A. L. Holland, B.A.; H. J. Irens, B.Sc.; F. E. Tyndall, B.Sc.; T. King; R. F. Folley; F. W. Judge; E. G. Sewell; G. P. S. Pollard, C.B.E.; W. K. Stewart, C.B.E., A.F.C., B.Sc., M.B., Ch.B.; and D. I. Malcomson, L.D.S.

(To be Continued)

R.A.F. R.C. at Henley

AT the Henley Royal Regatta, held last week, the Royal Air Force Rowing Club was represented by an eight in the Thames Cup, a four in the Stewards' Cup and a single sculler in the Diamond Sculls. In addition a four was entered for the Wyfold Cup by the No. 90 Group (R.A.F. Medmenham) Rowing Club. Unfortunately they were unable to repeat last year's successes, when they scored a sensational double by winning both the Thames and the Wyfold Cups.

The eight for the Thames Cup won their first two heats—against the Royal Chester R.C. and Quinton B.C.—but lost in the third round to the Thames R.C. by only a quarter-length in the fair time of 7 min 18 sec for the course. The coxless four (P/O. G. Sorell, F/O. C. F. Porter, A/C. W. H. Rand and A/C. J. M. Beresford), competing for the Stewards' Cup fared better; they beat both the London R.C. and the Danish Kobenhavns Club by three lengths, in 7 min 55 sec and 7 min 38 sec respectively. It was thought by many that they might pull-off the final against the Russian Krylia Sovetov crew; but this was not to be. Although the R.A.F. led at the beginning and the crews were level at the half-mile the Russians then went away in a masterful manner to win by 1¼ lengths in a time of 8 min 26 sec, a very creditable performance considering the strong head-wind at the time. The record for the Stewards' Cup stands at 7 min 13 sec.

In the Diamond Sculls Sen. A/C. S. C. Rand won his first heat easily in 9 min 7 sec but lost by two-and-a-half lengths to the Yugoslav, P. Vlasic, who was the eventual winner. It is interesting to note that Vlasic's time in the final was 8 min 31 sec whereas in his first heat, against the Russian Y. Tukalov, his time was two seconds less.

The R.A.F. Medmenham crew competing for the Wyfold Cup were beaten by three lengths in the first heat by Molesey.

"Flight" photograph

ATTACKER APPENDAGES: This Supermarine Attacker F.B.2 from the Royal Naval Air Fighting Development Unit performed at Bramcote last Saturday with normal rocket rails and with curious built-up structures terminating in a pair of crutches and streamlined supports.

New C.O. for Edinburgh F.C.U.

THE Air Ministry announces the appointment of W/C. J. H. Scott to command No. 3603 (City of Edinburgh) Fighter Control Unit, R.Aux.A.F. of which the Queen is the Honorary Air Commodore. W/C. Scott joined the R.A.F. 13 years ago as an aircraftman/observer and was later commissioned.

After serving in Canada as a navigator and at various training units, he joined No. 235 Squadron as a wireless navigator in the summer of 1943 and served on operational flying duties until the end of the year, when he was posted to the Middle East for operational flying duties with No. 201 Group H.Q. and No. 603 (City of Edinburgh) Auxiliary Squadron.

On returning to the United Kingdom, he undertook instructing duties at operational training units from January 1945 until his release in July 1946, and one year later joined No. 603 (City of Edinburgh) Squadron.

Posthumous Kenya Award

THE *London Gazette* has announced that the Queen has been graciously pleased to approve the award of the Distinguished Flying Cross to F/L. A. O. Pullman in recognition of gallant and distinguished service in operations in Kenya.

F/L. A. O. Pullman was posted to Kenya on March 31st, 1953, in No. 1340 Flight of Harvards, for operations against Mau Mau. The main task of the Harvards has been bombing and machine-gunning Mau Mau and their hideouts in the densely wooded and difficult country of the Aberdare Range and Mount Kenya. Pullman frequently carried out attacks which necessitated diving steeply into the gorges of Mathioya, Chania, Gura, and Zuti rivers, and often in conditions of low cloud and driving rain. The citation says that he consistently displayed a fine offensive spirit and great determination in pressing home his attacks. He carried out a total of 3,040 hours flying, during which he completed 220 bombing and strafing sorties. In addition, he commanded the flight and the R.A.F. satellite station of Mweiga from August to October 1953. F/L. Pullman, who was born in May 1916, was killed in Kenya in February this year while flying a Harvard aircraft.

"Flight" photograph

AT HENLEY: The Russian coxless four take the lead from the R.A.F. just after passing the half-mile post in the Stewards' Cup.

WESTON

AIRCRAFT INSTRUMENTS

for the indication of

ELECTRICAL POWER · TEMPERATURES ·
PRESSURES · TURBINE SPEEDS ·
CONTROL SURFACE MOVEMENTS ·

also

NAVIGATIONAL AIDS ·
GROUND TEST SETS ·

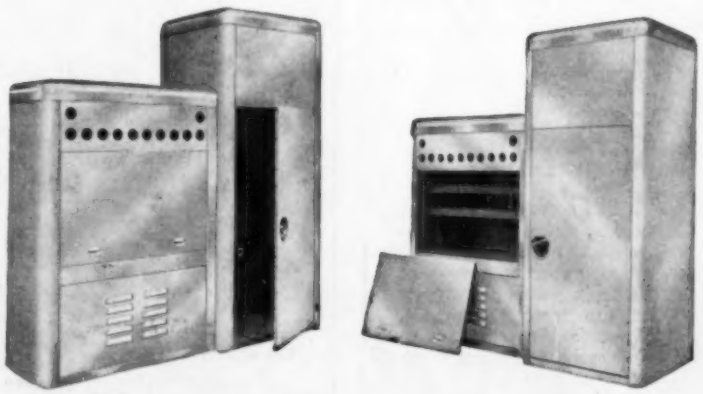
SANGAMO WESTON LIMITED
ENFIELD, MIDDLESEX, ENGLAND.
Tel: Enfield 3434 Grams: Sanwest, Enfield.

Scottish Factory: Port Glasgow, Renfrewshire.
Branches: London, Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton, Brighton.

This typical Weston Ratiometer, with 270° scale, and available in large or small S.A.E. case, can be used in conjunction with a resistance bulb, a pressure transmitter, or a position transmitter, to indicate a variety of temperatures, pressures or positions.

EVERYTHING IN SHEET METAL WORK

FOR AIRCRAFT AND AUTOMOBILE



CABINETS for RADAR, RADIO and TELEVISION
DYNAMO and MOTOR CASES
COACH AND BUS BODIES
Municipal and other ALL METAL Vehicle Bodies

Refrigeration
COLD STORAGE
HEATING
DRYING
Air Conditioning
MINING
Light Assemblies Components and STRUCTURES in SHEET METAL

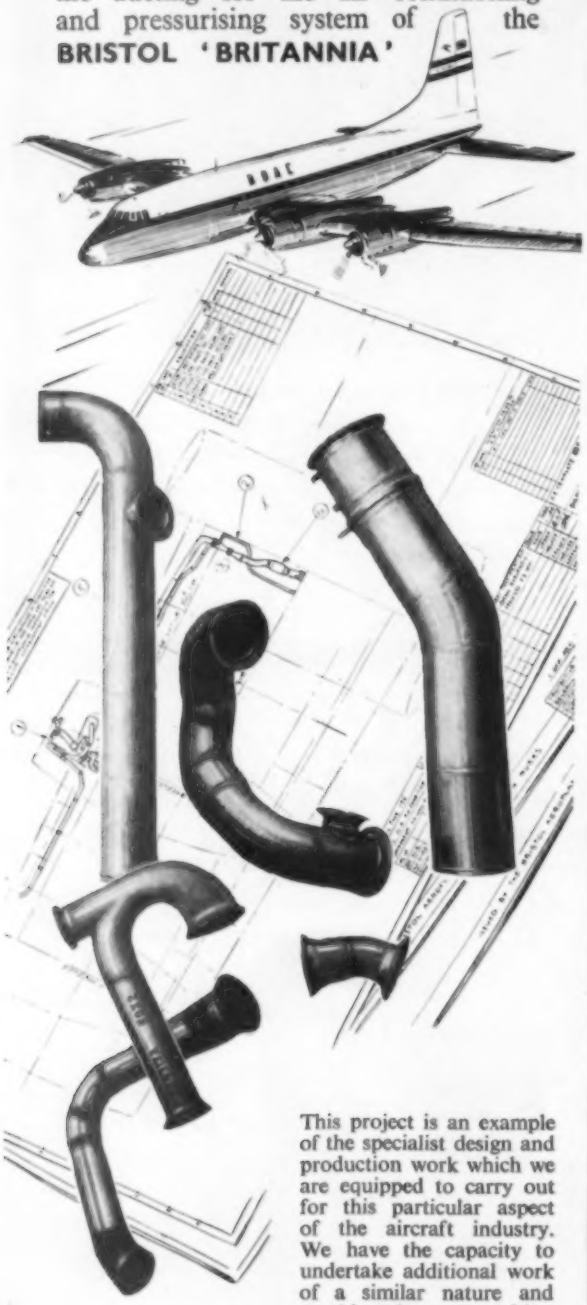
TELEGRAMS: BROMELPAR, SOUTHTOT, LONDON
161 WEST Rd., TOTTENHAM

E. G. Brown & Co. Ltd

TELEPHONES: TOTTENHAM 2257, 2258 & 2259
LONDON, N.17

Helliwells

have been entrusted with the design and subsequently the manufacture of the ducting for the air conditioning and pressurising system of the **BRISTOL 'BRITANNIA'**



This project is an example of the specialist design and production work which we are equipped to carry out for this particular aspect of the aircraft industry. We have the capacity to undertake additional work of a similar nature and would welcome enquiries.

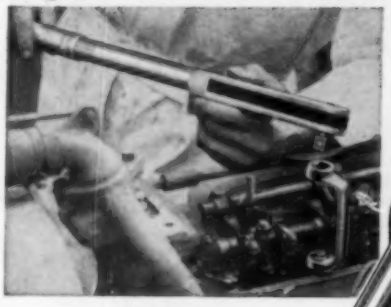
Helliwells Ltd

THE AIRPORT · WALSALL · STAFFS.

also at STANSTED AIRPORT and TREFOREST, PONTYPRIDD

Telegrams: HELLIWELL, WALSALL Telephone: WALSALL 4553 (6 lines)

Adjustable TENSION WRENCHES



SPEED WITH ACCURACY

STURDY & RELIABLE.
COMPACT DESIGN.
ADJUSTABLE.
3 PHASE SIGNAL BY SIGHT, SOUND & FEEL.
LOW PRICE.

6 Models cover 2-400 foot lbs for ⅜" ½" and ¾" Sq. Drive

TOOL UP WITH

CHROME ALLOY STEEL BRITOOL SERVICE TOOLS

JENKS BROTHERS LIMITED

BRITOOL WORKS, BUSHBURY, WOLVERHAMPTON, ENGLAND

NEW IMPRESSION NOW READY

Edited by F. Langford-Smith, B.SC., B.E. Senior Member, I.R.E. (U.S.A.), A.M.I.E. (Aust.)

Radio Designer's Handbook

The first impression of this greatly enlarged fourth edition sold out within a few weeks of publication and a second impression has been produced to meet the enormous demand.

8½ × 5½" : 1522 pages.
42s. net. By post 43s. 6d.

This book must not be distributed to Australia, New Zealand or the Americas.

Published for "WIRELESS WORLD"

From booksellers or from: Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

Radio Designer's Handbook is a comprehensive reference book, the work of 10 authors and 23 collaborating engineers, containing a vast amount of data in a readily accessible form. The book is intended especially for those interested in the design and application of radio receivers or audio amplifiers. Television, radio transmission and industrial electronics have been excluded in order to limit the work to a reasonable size.

Send for your copy!

All the important facts about Shafer ConCaVex Aircraft Roller Bearings . . . the unique space-saving, weight-saving design with unmatched shock and load capacity and providing 10° integral self-alignment. Send for your copy of Catalogue No. 54.

Write

SHAFER BEARING

DIVISION OF **CHAIN** BELT COMPANY

801 Burlington Avenue, Downers Grove, Illinois, U.S.A.

The CRW2
A very sensitive lever-actuated switch requiring ½-1 oz. force to operate.

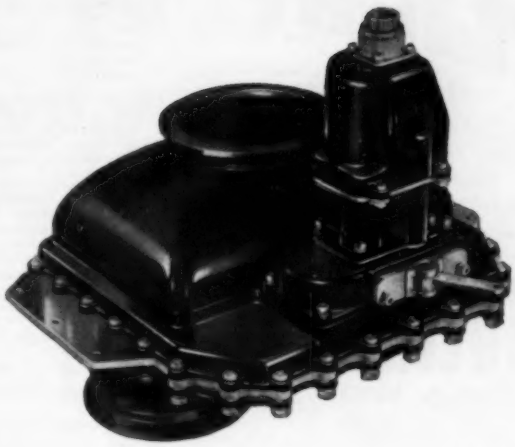
There are operations in industry which demand activation or immediate stoppage by a switch which will respond to the lightest touch. BURGESS make such a switch — the CRW2. They also make Micro-Switches for almost every other purpose.

PLEASE CONSULT OUR CATALOGUE 50/12

BURGESS MICRO-SWITCHES

Industry's Automatic Choice

BURGESS PRODUCTS CO. LTD., MICRO-SWITCH DIVISION, DUKES WAY, TEAM VALLEY, GATESHEAD 11. TELEPHONE: LOW FELL 75322 (3 LINES)



4" HOT AIR VALVE

This valve is one of a series of air conditioning control valves which have been developed to meet the requirements of modern aircraft. The valve is suitable for use where high throughput temperatures are met with, and when a low leak figure is a necessity. The mechanism is our well proven carbon gate slide valve, and the two outlet gates are moved differentially when the actuator is operated. An external follower lever is fitted, which may provide a positive valve position indication, or may be used as a follow-up lever where a feed back to the controller is required.

SPECIFICATION

Operating Conditions:	Through air temperature	350°C (max)
	Through air pressure	150 p.s.i. (max)
	Ambient air temperature	−70°C to + 150°C
	Operating time on load	15 seconds (nominal)
	Pressure drop across valve	1·3" WG at 300 c.f.m. 3·03" WG at 500 c.f.m.
	Maximum leak figure at 150 p.s.i. — 1 c.f.m.	
Electrical Data:	Connection	5 Pin Breeze type Plug CZ 28093
	Voltage	21 — 29 volts DC (24 v nominal)
Dimensions:	Length	10·75 inches
	Height	11·8 inches
	Width	14 inches
	Bore	4 inches
	Weight	21 lbs.

Teddington

TEDDINGTON CONTROLS LTD., CEFN COED, MERTHYR TYDFIL, SOUTH WALES. (Merthyr Tydfil 666)

London Office: 51 BROMPTON ROAD, S.W.3. KEN. 4808

T/106

FLIGHT and AIRCRAFT ENGINEER

PRESS DAY — *Classified advertisement "copy" should reach Head Office by* FIRST POST THURSDAY *for publication in the following week's issue subject to space being available.*

CLASSIFIED ADVERTISEMENTS

Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers, Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

Situations Vacant. The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

ROLLASON'S
WORLD WIDE SALES OF
TIGER MOTHS
Proves not only the suitability of this Aircraft for Private Owners, Flying Clubs, Top Dressing, Glider Towing, but also our Customers' knowledge of our
HIGHEST STANDARD OF OVERHAUL
Let us quote you for an aircraft to
YOUR SPECIFICATION
Fully Reconditioned
A.R.B. RELEASED SPARES
of every description available ex-stock
W. A. ROLLASON LTD.
Croydon Airport, Surrey
Telephone: CROydon 5151/4
Cables: ROLLAIR, CROYDON

WOLVERHAMPTON AVIATION LTD.
THE LEADING LIGHT AIRCRAFT ENGINEERS
THE AIRPORT, WOLVERHAMPTON
Telephone: Fordhouses 2191/4

FOR SALE
AVRO XIX. Series 2 Executive Model.
WHITNEY STRAIGHT. 12 months' C. of A.
PROCTOR V's. Choice of three; two with dual control and one with long-range tank.
MILES M28.
PROCTOR I. Dual control.
GEMINIS. Choice of two. Low engine and airframe hours. C. of As. expire April 1955.
AUSTER J.1. Low hours; 12 months' C. of A.
AUSTER J.4. Low hours, C. of A. expires April, 1955.
MESSENGER. Gipsy Major engine. 4-seater.
TIGER MOTHS. With or without C. of A.

LONDON OFFICE: Telephone: ABBEY 2345
78, BUCKINGHAM GATE, S.W.1.

AIRCRAFT FOR SALE

W. S. SHACKLETON, LIMITED
for
PERCIVAL PRINCES and MARATHONS
Please see our displayed advertisement on page 1.

W. S. SHACKLETON, Ltd., 175 Piccadilly, London, W.1. Tel.: HYDe Park 2448-9. Cables: "Shackhud, London." [0070

AEROSERVICES, LIMITED
for DAKOTA Aircraft
THE supply of overhauled Pratt and Whitney engines, Hamilton propellers, Stromberg carburettors, Bosch and Scintilla magnetos and ancillary equipment is our speciality.
AEROSERVICES, LIMITED
CROYDON AIRPORT
TELEPHONE: CROydon 9373. Cables: "Aeroserv, Croydon." [0940

R. K. DUNDAS, Ltd.
AEROPLANES
AEROPLANES. We have fine examples of the following machines ready for immediate sale:

Auster Autocrat	Vikings
Auster V	Dakotas
Proctor	Doves
Messenger	Lodestars
Gemini	Rapides

R. K. DUNDAS, Ltd., 29 Bury Street, London, S.W.1.
WHI. 2848. Cables: "Dundassero, Piccy, London." [0559

CARTWRIGHT HAMILTON AVIATION DIVISION offer
LARGE selection of aeroplanes, including Yorks, Oxfords, Austers, Proctors, Tiger Moths, also other light aircraft suitable for private flying and clubs. Comprehensive spares service available. 282 Kensington High Street, W.14. WEStern 0207-8. [0751

AVRO XIX aircraft, with metal wings and under 360 hours since new on airframe, engines and propellers.
FULL C. of A. Interior and radio to customer's own requirements.
AEROCONTACTS, Ltd., Gatwick Airport, Horley, Surrey. Tel.: Horley 1510, Ext. 1. [2270

HORNET MOTH. Two-seater dual control and blind flying panel. Current C. of A. £350.—E. Crabtree, Deanstones Lane, Queensbury, Bradford. Tel.: Queensbury 2318. [0609

AUSTER Autocrat, immaculate condition, 300 hours since new. Fully equipped, many extras. 12 months C. of A. £750. No offers.—Warden Aviation, Tel.: Worthill 288. [2265

AIRCRAFT WANTED

OUR demand for good used aircraft of all descriptions is very great. Operators or owners wishing to dispose of aircraft, engines, or anything aeronautical, are asked to communicate at once to:—
R. K. DUNDAS, Ltd., 29 Bury Street, London, S.W.1.
WHI. 2848. Cables: "Dundassero, Piccy, London."

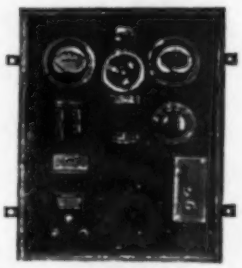
CROYDON AIRPORT. CRO. 7744. [0558

AIRCRAFT urgently wanted. Four-engined passenger and freight aircraft, also Rapides, Tiger Moths, Dakotas with or without C. of A.—Send price and full particulars to Box 6384. [2287

AIRCRAFT ACCESSORIES AND ENGINES

MERLIN, Griffin, spares, tools, rigs, jigs, 36DD, 36HH; propeller spares, tools, 25L, 25M; small tools 1A-1B-1C; A.G.S.; electrical 37A; starters 37F; electrical; slip gauges, mercer sets, surface plates, micrometers, clocks, 115V turbo-compressors. Many other spares. Enquiries welcome.—Thomas, Cairnleith, Afyth. [2228

ACCUMULATOR CAPACITY TEST SET
A.M. Type 5A/2181



- For discharging at a controlled and recorded rate, 2, 6, 12 and 24 volt batteries
- Automatic 'trip' operates when cells reach 1·8 volts
- Actual amp./hr. capacity reading
- Infinitely variable discharge rate from ·1 to 10 amps
- Continuous indication of volt drop
- In fully guaranteed condition
- Price £15 plus carriage

PROOPS BROTHERS LTD.
117-119 CHARLOTTE STREET, LONDON, W.1.
Telephone: LANgham 0141-2 *Cables:* Proopslim, London

AIRCRAFT FOR SALE
L. K. REGENT LTD. (AIR DIVISION)
announce their worldwide brokerage service for the disposal of civil and military aircraft, radio and radar airfield equipment. All quotations C.I.F. and F.O.B. United Kingdom ports. Flight deliveries arranged.
4-engined and single-engined aircraft, also helicopters available.
Airlines and foreign governments served.
Principals only. No agents need apply.
L. K. REGENT LTD. (AIR DIVISION),
MADDOX HOUSE, 215-221 REGENT ST., LONDON, W.1

AIRCRAFT ACCESSORIES AND ENGINES

SPARES SPARES SPARES

HEREWITH a few lines which can be supplied ex-stock:—
2011, 2017, 4118984 and 4118979 hyd. selector valves.
A4949, booster pumps.
AN4100, AN4101 and AN4102 fuel pumps.
82307 spring contacts.
AN210-1A, -2A, -3A, -4A and -5A pulleys.
2000 cowl gill jacks.
All C47 hydraulic components.
Gyropilot components.
A. J. WALTER, Gatwick Airport, Horley, Surrey. Tel.: Horley 1420 and Horley 1510, Ext. 105. Cables: "Cubeng, London." [0268

VENDAIR, Croydon Airport, suppliers of aircraft components, engines and ancillary equipment for British and American aircraft.—Vendair, Croydon 5777. [0605

INSTRUMENT and autopilot overhaul, test, sales. Dakota and most other instruments from stock.—Repaircraft, Broadbridge Heath (Tel. 11), Horsham, Sussex. [2246

AIRCRAFT FILAMENTS, British and American from a 3V instrument bulb to a 3,000W airfield landing lamp; aircraft landing lamps complete with motors, etc.; glass and other fuses; U.S. generators 01; P1; Amplidine. U.S. cabin heaters and a large variety of ancillaries. Inquiries for home and export invited. —Suplex Lamps, Ltd., 239 High Holborn, London W.C.1. Cables: Suplexlamp, London. [0433

AIRCRAFT ACCESSORIES AND ENGINES WANTED

LINK Trainer Turbine wanted. Cheap.—Particulars to Brown, 8 Little Trinity Lane, E.C.4. [2254

DOMINIE aircraft spare parts schedule required. Usable s/h copy acceptable.—Write Box 7983, Frost-Smith Advg., 64 Finsbury Pavement, London, E.C.2. [2269

AIR CHARTER

HELICOPTER charter, U.K. and overseas. Sikorsky S.51 (3 passengers).—Autair, Ltd., 63 Wigmore Street, London, W.1. WELbeck 1131. [2134

AIRCRAFT SERVICING

REPAIRS and C. of A. overhaul for all types of aircraft.—Brooklands Aviation, Ltd., Civil Repair Service, Sywell Aerodrome, Northampton. Tel.: Moulton 3218. [0307

CLOTHING

R.A.F. officer's uniforms (National Service). Good condition. 5 ft. 11 in., slim.—Box 6361. [2279

R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kits for sale, new and reconditioned.—Fishers, Service Outfitters, 85-88 Wellington St., Woolwich. Tel.: Woolwich 1055. [0567

CLUBS

LONDONERS! Your most accessible and reasonable club. M.C.A. approved courses. Austers 45/- hour, trial lesson 17/6. Phone Penguin Flying Club, Vic. 1300. [0285

PLYMOUTH AND DISTRICT AERO CLUB for Auster and Tiger Moth flying instruction; dual and solo at £3 per hour reducing to less than £2 per hour for solo flying on "Fly Yourself Hire" basis; flying instructors' courses and M.C.A. approved course for private pilot's licence.—Tel.: Plymouth 72753. [0341

HERTS and Essex Aero Club. Stapleford Tawney Aerodrome. M.C.A. approved private pilot's licence course. Auster, Tiger, Hornet, Messenger and Proctor aircraft. Trial lesson, 35/-. 15 miles centre of London. Central Line Underground to Theydon Bois, bus 250 to Club. Open every day.—Tel.: Stapleford 210. 0230

CONSULTANTS

R. W. SUTTON (CONSULTANTS), Ltd., 7 Lansdown Place, Cheltenham. Tel. 5811. [0291

GROUP CAPT. E. L. MOLE, B.Sc., A.F.R.Ae.S., 31 Dover St., London W.1. Grov. 5902. [0400

WING COMMANDER R. H. STOCKEN, F.R.Ae.S., Eagle House, 109 Jermyn St., London S.W.1. Tel.: Whitehall 8863. [0419

R. K. DUNDAS, Ltd., have been giving the correct answer to aviation problems for twenty years. Technical. Purchasing. Operations. Marketing.—29 Bury Street, London S.W.1. WHI. 2848. [0560

ROZALEX LTD • 10 NORFOLK ST • MANCHESTER 2

16 x 50
THE GLASS WHERE DISTANCE DOES NOT MATTER

SUPER
LIEBERMAN & GORTZ
Really portable. Never in the history of Binocular manufacturing has a better, brighter, clearer, more powerful, wider angle, steadier vision Binocular been produced at such a price. At £48 they are really £15 cheaper than the nearest competitive value. Normal centre focus and right eyepiece adjustment. See the thin cloudy coastline tens of miles away suddenly appear in all detail before your very eyes as if by magic. Cash price £48 or send £8 deposit and £4 monthly. Complete with case and sling. Other models: 8 x 25, £10.17.6; 8 x 30, £11.17.6; 8 x 32, £13.19.6; 8 x 40, £15.19.6; 10 x 40, £17.19.6; 12 x 40, £18.19.6; 15 x 40, £19.19.0; 20 x 40, £19.19.0. Or all on terms. Free lists other bargains.
LIEBERMAN and GORTZ
21X47
Sent for 17/6
CASH PRICE 19 GNS.

Brighter, more powerful and wider angle than any other Continental Prismatic Binoculars. Fantastic, and a revelation to all. ONLY Lieberman & Gortz 21 x 47 (O.G. internal diameter) lenses will give you such 3-D viewing. Day and night BLOOMED LENSES. Height 9¼ x 6½ in. Weight 28 ozs. Complete in case with leather slings. 17/6 deposit. Balance 39/6 monthly. Cash price £19.19.6. Worth much more.
Free lists, Binoculars, Tents, Watches, Marquees, etc. TERMS.
Headquarter & General Supplies Ltd. (Dept. FLI/37), 196/200 Coldharbour Lane, Loughboro' Junction, London, S.E.5.
Open all day Saturday. 1 p.m. Wednesday.

CONTACT LENSES

MODERN Contact Lens Centre, 7(D1) Endsleigh Court, W.C.1. Deferred terms. Booklet sent. [0342

HANGARS FOR SALE

HANGAR from stock. Steel framing only or delivered sheeted and erected complete. Suitable for export. Size 120 ft. span by 240 ft. long by 25 ft. clear height. —Write Box X652, Willing's, 362 Grays Inn Road, W.C.1. [2286

MISCELLANEOUS

PERFECT tube bends, any metal.—Maji-Ped, 103 Kitchener Road, Birmingham 29. [2280

STEEL lattice and guyed radio masts, 100 ft. high, for sale. Delivery from stock. Excellent condition. —Bellmans, Terminal House, S.W.1. [2206

WANTED

WANTED. Scrap Mercury, aircraft plugs, contacts (new or used), copper, brass and all non-ferrous and scrap precious metals in any form.—Belgrave Buyers (F.), 5 Belgrave Gardens, London N.W.8. MAI. 7513. [2255

PATENTS

THE proprietor of British Patent No. 636497, entitled "Screw Propeller Blade" offers same for license or otherwise to ensure practical working in Great Britain. —Inquiries to Singer, Stern and Carlberg, 14 E. Jackson Blvd., Chicago 4, Illinois, U.S.A. [2235

THE Office National d'Etudes et de Recherches Aéronautiques, 55 Bd. Malesherbes in Paris (France), holder of British Patents No. 673,629, dated June 11th, 1952, "Improvements Relating to Supersonic Chambers"; No. 673,536, dated June 11th, 1952, "Improvements Relating to Supersonic Combustion"; No. 674,854, dated July 2nd, 1952, "Improvements in Jet Propulsion Plants, in Particular for Aircraft"; and No. 675,994, dated July 23rd, 1952, "Improvements in or Relating to Aircraft Wings," would like to deal with constructors in Great Britain through licensing. [2282

THE Office National d'Etudes et de Recherches Aéronautiques, 55 Bd. Malesherbes, Paris, France, holder of British Patents Nos. 682,418, dated May 24th, 1950, "Improvements in Shock Wave Compressors, in particular for Aircraft Continuous Flow Engines"; No. 679,081, dated November 17th, 1950, "Apparatus for Measuring Magnetic Declination and Dip Aboard Aircraft"; No. 684,088, dated September 10th, 1948, "Improvements in Distance Measuring Systems"; No. 684,313, dated September 10th, 1948, "Improvements in Systems for Guiding Dirigible Craft"; No. 684,314, dated September 20th, 1948, "Improvements in Blind Landing Radio Systems for Aircraft"; No. 684,089, dated September 22nd, 1948, "Systems of Radio-navigation"; No. 684,315, dated February 18th, 1949, "Means for Indicating the Angle of Orientation of a Dirigible Craft with Respect to a Desired Path Relative to Ground"; and No. 680,995, dated November 22nd, 1948, "Point-to-point Ultra-short-wave Radio Links," would like to deal with constructors in Great Britain through licensing. [2281

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

APPLICATION No. 309. From Airwork Ltd., of 15 Chesterfield Street, London W.1. For a Colonial Coach Service with Hermes aircraft for the carriage of passengers and supplementary freight between London Airport and Singapore with intermediate technical stops at Malta, Beirut, Bahrein (night stop), Karachi, Delhi (night stop), Calcutta and Bangkok (night stop), at a frequency of one service per fortnight for an initial period of one year from 15th March, 1955.

APPLICATION No. 312. From Aquila Airways, Ltd., of 1 Great Cumberland Place, London W.1. For a normal scheduled service with Solent Flying Boats for the carriage of passengers, supplementary freight and mail between Southampton (Marine) and Genoa and/or Santa Margherita at an initial frequency of from one to three services weekly, increasing to one service daily according to traffic demand, during the period from 1st June, 1955 to 31st May, 1962.

THESE applications will be considered by the Council under the terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [2288

VICKERS-ARMSTRONGS

LIMITED
(AIRCRAFT DIVISION)

WEYBRIDGE, SURREY

require:

(a) **AIRCRAFT SERVICING ENGINEERS** (to commence on civil aircraft) for airframes—with "A" licence—and electrical systems—preferably with "A" licence—as representatives on service in this country and overseas as necessary.

(b) **TECHNICAL INSTRUCTOR** (electrical) for Aircraft Servicing School; must have had good technical training, sound practical experience in the maintenance of modern aircraft, and be capable of lecturing, drawing instructional diagrams and compiling lecture notes for the use of students.

(c) **SENIOR AND INTERMEDIATE WEIGHTS ENGINEERS,** with aircraft experience, for employment at HURN depot, nr. Bournemouth.

(d) **DRAUGHTSMEN,** for design modification and detail work on modern aircraft, at HURN depot, nr. Bournemouth and main WEYBRIDGE Works; experience on aircraft not essential, provided practical and academic qualifications are suitable.

(e) **INSPECTORS/VIEWERS** to cover work on aircraft finals, and in Tool Room, Tinsmiths and Sub-assemblies Shops; also to inspect many other branches of production and development work.

(f) **FITTER-ERECTORS,** skilled or experienced semi-skilled, on aircraft preparation for flight work at Wisley Aerodrome; also production in main Erecting Shop at Weybridge.

Applications (quoting date and prefix letter of advertisement) to:

Employment Manager,

VICKERS-ARMSTRONGS, LTD.

WEYBRIDGE WORKS,

WEYBRIDGE, SURREY

Weybridge station is 30 minutes from London on the main Waterloo/Portsmouth line.

Additional buses operate to and from the Works at starting and finishing times.

Canteen facilities.

Applicants should be in a position to arrange their own housing accommodation. Assistance can only be given with individual lodgings.

PACKING AND SHIPPING

R. AND J. PARK, Ltd., 143-9 Fenchurch St., E.C. Tel.: Mansion House 3083. Official packers and shippers to the aircraft industry. [0012

EXPORT PACKING SERVICE, Ltd., Imperial Buildings, 56 Kingsway, W.C.2. Tel.: Chancery 5121-2-3. Scientific packers to the Services and industry. Specialists in the packing of aircraft and aircraft components. Approved packers for the Admiralty, A.I.D., I.F.V., C.I.A., C.I.S., I.E.M.S., M.o.S. and many foreign Government Departments. [0920

TUITION

AVIGATION
Limited

30 CENTRAL CHAMBERS, EALING, W.5
(Tel.: EALing 8949)

WE offer all courses appertaining to pilot/navigator licences. Multicolour lithograph presentation of lecture precis to I.C.A.O. standards.

LINK training dept. situated centrally in London. Full briefing for instrument rating 25/- per hour. Block rate, 10 hours, reduces to 22/6. [0248

LONDON SCHOOL OF AIR NAVIGATION

OFFERS the only integrated and co-ordinated personal coaching for all M.T.C.A. licences, I.C.A.O. standards. Successes highest in country. "Home Study" courses excellent alternative. Full coverage. Modern presentation. Attractive terms. Our proven methods guarantee income in shortest possible time.

LINK, briefing, procedures, R/T, type ratings, refresher and instrument flying.

33 Ovington Square, Knightsbridge, S.W.3. KEN. 8221. [0277

SOUTHEND-ON-SEA MUNICIPAL AIR CENTRE and FLYING SCHOOL. Winners of Lennox-Boyd Trophy for Efficiency, 1953.

COMPREHENSIVE flying training for all pilots' licences, ratings and endorsements. Special facilities for instrument, night flying and "twin" conversions. No entrance fee or subscription. M.T.C.A. approved 30-hour course.

MUNICIPAL Airport, Southend-on-Sea, Essex. Rochford 56204. [0453

SURREY Flying Club, Croydon Airport. M.C.A. approval for private pilots' licences. Open seven days a week. Croydon 5152. [0293

LINK training at £1 per hour. Courses of instruction up to instrument rating standard.—Airways Aero Associations, Ltd., Room 118, Croydon Airport. Tel.: Croydon 7744, Ext. 200. [0706

LONDON AEROPLANE CLUB, Panshanger Aerodrome, £3/5/- per hour, Tigers, Chipmunks, Auster, Hornet, Moth, dual and solo. Touring facilities. Private owner accommodation. Tel.: Essendon 305. [2108

A.F.R.Ae.S., A.R.B.Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms; over 95 per cent. successes. For details of exams and courses in all branches of aeronautical work, navigation, mechanical eng., write for 144-page handbook free.—B.I.E.T. (Dept. 702), 29 Wright's Lane, London W.8. [0707

BRITAIN'S AIR UNIVERSITY CAN TRAIN YOU for an airline career. Hundreds of today's airline captains and key maintenance personnel are graduates of this famous establishment. Courses are available for Commercial and Airline Transport Pilots' Licences, Instrument rating and Maintenance Engineers' Licences. FOR details of these and other courses, apply to—The Commandant, Air Service Training, Ltd., Hamble, Southampton. [0970

LEARN to fly for £26. Instructors' licences and instrument flying for £3/5/- per hour. Night flying £4/5/- per hour. Residence 5 gns. weekly. Approved M.C.A. private pilot's licence course. Specialized course for junior commercial pilot's licence.—Wiltshire School of Flying, Ltd., Thruxton Aerodrome, nr. Andover, Hants. Tel.: Weyhill 352. [0253

AERONAUTICAL. Comprehensive full-time technical and practical training for careers in all branches of aviation engineering. Diploma course leads to interesting executive appointments in civil aviation design and development, draughtsmanship, maintenance, etc. Extended courses to prepare for A.F.R.Ae.S. and A.M.I.Mech.E. examinations.—Write for prospectus to Senior Master, College of Aeronautical Engineering, Chelsea, London, S.W.3. Flaxman 0021. [0019

PUBLIC APPOINTMENTS

COMMONWEALTH OF AUSTRALIA

Department of Supply

Research and Development Branch

Central Staff, Melbourne, Victoria

SENIOR SCIENTIFIC OFFICER

SALARY: £1,352 to £1,442 p.a.

DUTIES: Research activities with Australian Army Operational Research Group. Work will involve the scientific study and analysis of a wide range of operational problems including the assessment of new weapons.

(*Continued at top of column* 1 *on page* 33)

SPECTACLES ANTI-GLARE
R.A.F. MK. VIII
Complete with strong case **18/6**

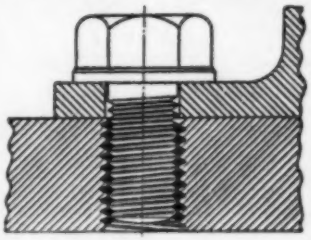
GOGGLES
MK. VIII
19/6

Spare lenses available 7/6 *pair*
Tinted or clear

Terms to Flying Clubs *Send 3d. for illust. catalogue*

D. LEWIS LTD. (DEPT. F.)
124 GT. PORTLAND ST., LONDON, W.1
Tel.: Museum 4314 *Grams: Aviakit, Wesdo, London*

WIRE
THREAD INSERTS



FOR NEW DESIGNS
AND SALVAGE

CROSS MFG. CO. (1938) LTD.
COMBE DOWN, BATH
TEL.: COMBE DOWN 2355/6

*** NOTE**
FOR SPARES
Instruments, Test Rigs, Ground Equipment, etc.
(A.I.D. or A.R.B. Released)

TRY
STARAVIA
BLACKBUSHE AIRPORT
CAMBERLEY, SURREY
'Phone: Camberley 1600

TIGER MOTHS FOR CROP DUSTING
Fitted fully approved hopper, ready for topdressing operations.
C.I.F. Quotations per return
MUIR & ADIE LIMITED
CROYDON AIRPORT, SURREY, ENGLAND
Cables: MUIRAIR, CROYDON

PUBLIC ANNOUNCEMENTS

(*Continued from foot of column 2, page 32*).

QUALIFICATIONS: Degree of high standard in mathematics or one of the physical sciences. Experience in the design of experiments and statistical analysis would be an advantage.

CONDITIONS: The appointee will be seconded to Army Headquarters, Melbourne, for a period of at least three years.

THE salaries quoted are in Australian currency.

WHERE permanent appointment is accepted, the successful applicant will be eligible to become a contributor to the Commonwealth Superannuation Scheme.

UNDER specified conditions, first class boat fare (if first class berth available) of the appointee and his dependants (wife and dependent children) will be paid by the Commonwealth.

APPLICATION forms are obtainable from:

THE SENIOR REPRESENTATIVE (A.P.19),
Department of Supply,
Australia House,
Strand,
London, W.C.2

with whom applications must be lodged by July 23rd, 1954. [2275

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

SAUNDERS-ROE, LIMITED

have
vacancies
for

SENIOR STRESSMEN (2)

APPLICANTS should have engineering degrees or the equivalent and five years' aircraft experience.

AERODYNAMICISTS (2)

APPLICANTS should be between 28 and 30 years of age and have engineering degrees or the equivalent and experience in the aircraft industry.

DRAUGHTSMEN

Aircraft experience desirable.

GOOD working conditions. Staff assurance and pension schemes. Practical assistance with housing.

EXPERIENCED engineers interested in obtaining employment in the Isle of Wight are invited to write, stating age, experience, etc., and quoting Ref. F/7 to the Personnel Officer, Saunders-Roe, Ltd., East Cowes, Isle of Wight. [2135

ARMSTRONG SIDDELEY MOTORS, LTD.

AS a result of the creation of a separate rocket division of Armstrong Siddeley Motors, opportunities exist in a new and interesting field of engineering. Applicants should have an appropriate degree or Higher National Certificate. Previous experience in this work is not essential if the applicant has enthusiasm and ability. Vacancies exist in all grades of the following positions:

TECHNICAL ASSISTANTS

DESIGNERS

DRAUGHTSMEN

APPLY to Reference SA.2-Rockets, Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [2295

JOSEPH LUCAS

(GAS TURBINE EQUIPMENT) LTD.

have vacancies for

DESIGNERS AND
DEVELOPMENT ENGINEERS

AT their Marston Green and Shaftmoor Lane Factories.

EXPERIENCE of aircraft electrics or hydraulics would be an advantage, but not essential.

THESE appointments are pensionable and offer good prospects to individuals with initiative and technical ability.

APPLICATIONS, giving details of experience and qualifications, to:—

PERSONNEL Manager, Joseph Lucas (Gas Turbine Equipment), Ltd., Shaftmoor Lane, Hall Green, Birmingham. [2267

SENIOR draughtsman required with comprehensive experience of fuel and oil systems to initiate and take charge of section. Good welfare facilities including staff pension scheme.—Applications, in writing, to the Personnel Manager, Hunting Percival Aircraft, Ltd., The Airport, Luton, Beds, stating age, experience and salary required. 2224

A. V. ROE
& CO. LIMITED
AIRCRAFT CONSTRUCTORS
MANCHESTER

have the following vacancies in their Design and Research Departments for qualified Technicians to work on the design and development of supersonic bombers and fighters.

DESIGN OFFICE

TECHNICAL ASSISTANT to investigate special problems connected with materials, fatigue, transparencies, thermal stress, etc. The work will cover a wide field of modern research and involves the collection of data and the planning and analysis of research work and tests for the purpose of obtaining design information.

TECHNICAL ASSISTANT preferably with a knowledge of aerodynamics to investigate aircraft vibration, flutter and general aeroelastic problems involving a study of the theory and its application to particular problems of supersonic flight. This is an interesting and long-term programme of work.

A NUMBER OF TECHNICAL ASSISTANTS for analysing structural problems. Applicants will be required to apply their knowledge of mathematics, strength of materials, aero structures, aerodynamics, etc., to the evaluation of design loads, structural stresses and deflections of conventional and unconventional structures. The work will also cover the preparation of structural testing programmes and investigation into new methods of stress analysis appropriate to new methods of construction.

ELECTRICAL ENGINEER with knowledge of AC and DC generation, protection, distribution and the utilisation of power for military aircraft, to work on the design of servo-mechanisms, ancillary electrical equipment and electro-mechanical devices. A good grounding in the application of magnetic amplifiers and electronics is also desirable.

Applications, giving full particulars of experience, qualifications, age, etc., should be addressed to:

THE LABOUR MANAGER

A. V. ROE
& CO. LIMITED
Greengate, Middleton, Manchester

SITUATIONS VACANT

AERODYNAMICIST

A RAPIDLY expanding precision instrument manufacturing firm holding long-term design and development contracts for autopilots has a vacancy for an aerodynamicist having a minimum of 3 years' industrial experience on Stability and Control of aircraft. The position offers excellent opportunity for a man of initiative and sound training.

PLEASE forward full details of career and salary required (which will be treated in strict confidence) quoting reference A.E. to Box 6398. [2291

THE SUPERMARINE WORKS OF VICKERS-ARMSTRONGS, LIMITED

NOW IN PRODUCTION OF SUPER-PRIORITY AIRCRAFT, REQUIRE:

TECHNICAL ASSISTANTS

for structural analysis and structural testing. Qualification, degree or H.N.C. Previous experience of this work not essential.

AERODYNAMICISTS

Qualification: degree or equivalent standard. Some experience in aeronautical engineering desirable.

Write, giving full particulars, including age and salary required, to Personnel Department, Hursley Park, near Southampton. [2211

SENIOR wireless operator mechanic required by the FALKLAND ISLANDS GOVERNMENT for service in South Georgia. Tour of 18, 24 or 30 months in the first instance. Commencing salary according to age in scale £400 rising to £540 a year plus FREE quarters, light, heat and rations. Free passages and liberal leave on full salary. Candidates must hold first-class P.M.G. cert. and have a thorough knowledge of Creed Automatic Transmitting equipment. They must be familiar with standard coast station transmitting and receiving procedure and accounting.—Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30640/FE. [2289

WANTED: draughtsmen with or without Higher National Certificate for:—
(a) Structural Design in Aluminium.
(b) Plant and Machine Design.

LOCATION: Banbury or Newport.

GOOD salary and prospects.

WRITE: Northern Aluminium, Bush House, W.C.2. [2268

A VACANCY exists at Smiths Aircraft Instruments, Ltd., nr. Cheltenham, for an assistant in the spares and modification section of the engineering department.

DRAWING office experience and sound engineering background essential.

EXPERIENCE in assembly methods and servicing of aircraft instruments desirable.

SALARY according to age and experience.

PLEASE write, stating age, experience and salary required, quoting Reference 30/EN, to Personnel Manager. [2297

VACANCIES exist in the Cheltenham laboratories of Smiths Aircraft Instruments and the research organization for aeronautical or electrical engineers having experience of electric and hydraulic servo mechanisms, radio navigation equipment and experimental flight testing; a good general knowledge of aircraft construction and operation is essential.

APPLICANTS should hold a degree or the equivalent, have a medical standard equal to Class "A" Life Insurance, and should be willing to travel within the U.K. and abroad.

THE starting salary will depend on qualifications, age and experience.

THE Company will give what assistance they can in obtaining housing for successful applicants.

APPLICATIONS, with details of qualifications, experience and salary required, should be made, in writing, to the Personnel Department, S. Smith and Sons (England), Ltd., Bishops Cleeve, Glos., quoting Reference 29/EN. [2296

METHODS and estimating engineer required for Planning and Contracts Dept. Tool making and costing experience essential. Aircraft experience. Sussex coast.—Box 6296. [2262

AIRCRAFT accessory manufacturer requires senior bearing research scientist for new section covering use of gas and antifriction bearings operating at speeds up to 150,000 r.p.m.—Write Box 6277. [2249

LICENSED ground engineer wanted for club and private aircraft maintenance on the south coast. "A" and "C" licences required on Messenger, Magister, Gemini and Aerovan.—Box 5830. [0345

BRITISH EUROPEAN AIRWAYS require an electrical/instrument instructor at Northolt, transferring later to London Airport. Qualifications: engineering apprenticeship, preferably in aircraft instruments; basic electrical/electronic knowledge as applied to aircraft instruments, in particular for Smith's Electronic Pilot, Zero Reader, Gyrosyn Compass; technical knowledge to 'X' licence standard with at least 5 years' maintenance experience. Salary £570-£785 p.a. —Applications with full details to Personnel Officer, Flight Operations Dept., B.E.A., Keyline House, Ruislip, Middlesex. [2283

DOWTY EQUIPMENT LTD.

CHELTENHAM

require

STRESSMEN

with Higher National Certificate or Degree for interesting work on aircraft undercarriages and hydraulics.

DRAUGHTSMEN

for Hydraulics and Undercarriage Division.

These are permanent positions with excellent prospects of advancement.

Attractive environment.

Good working conditions.

Five-day week. Canteen.

Pension scheme.

Write in tabulated form to Personnel Manager.

THE DUNLOP RUBBER CO. LTD., AVIATION DIVISION, COVENTRY

requires

SENIOR DESIGN DRAUGHTSMEN

capable of carrying projects through from conception to completion.

Also

JUNIOR DETAIL DRAUGHTSMEN

and

SENIOR AND JUNIOR STRESSMEN

Experience of light hydraulic and pneumatic equipment would be advantageous.

The company's programme offers excellent prospects of permanent interesting employment under congenial working conditions.

Salary will be commensurate with qualifications and experience, full details of which should be sent to:—

THE LABOUR MANAGER,
DUNLOP RUBBER CO. LTD.,
AVIATION DIVISION,
FOLESHILL, COVENTRY

AIRCRAFT SPRING WASHERS

TO B.S. SPECIFICATION S.P.47

CROSS MFG. CO. (1938) LTD., COMBE DOWN, BATH

SITUATIONS VACANT

SENIOR stressman urgently required.—Apply in writing, stating age and experience, to the Chief Designer, The Heston Aircraft Company, Ltd., Heston Airport, Hounslow, Middx. [2277

SERVOMECHANISMS engineer required by Gloucestershire firm for theoretical work on aircraft automatic control systems. Good honours degree and sound experience necessary.—Apply: Box 6360. [2278

PILOT with instructor's rating and commercial licence required for temporary employment at Plymouth Airport.—Particulars to the Manager. Tel.: Plymouth 72752. [2298

AIRCRAFT engineers with "C" and/or "A" licences with "Hermes" endorsement, required by Skyways.—Write full particulars to the Personnel Manager, 7 Berkeley Street, W.1. [2273

A FIRM of aero engine manufacturers require a quality engineer. Applicants should have held positions of chief or assistant chief inspector, or equivalent qualifications. Reply: Box AC91352, Samson Clarks, 57-61 Mortimer Street, W.1. [2292

SKYWAYS, Ltd., have a vacancy for an assistant to the Technical Manager (London). Preferably young ex-National Service man with experience in R.A.F. Technical Branch.—Write to Personnel Manager, 7 Berkeley Street, W.1. [2274

SENIOR and intermediate design draughtsmen, with good experience of aircraft or light structural or mechanical engineering, required for aircraft and armament project work.—Apply, by letter, to Portsmouth Aviation, Ltd., The Airport, Portsmouth. [0612

SERVICE engineers required for installation and flight trials of aeronautical navigational equipment. Applicants must be of good appearance, physically fit, prepared to travel, have electrical/electronic theory to C. and G. Radio III and be willing to prove his ability to apply this theory to practical problems.

APPLY with full details, quoting No. 1489 to Personnel Manager, Sperry Gyroscope Co. Ltd., Great West Road, Brentford, Middx. [2293

RADIO engineers, fully licensed in both "A" and "B" categories, are required by the servicing division of Field Aircraft Services, Ltd., Bovingdon Airport, Herts.—Applications, showing full details of experience, licences and salary required, should be addressed to the Manager. [2239

"A" and/or "C" aircraft engineers are urgently required by Field's of Bovingdon Airport for maintenance duties on their fleet of Viking, York and Dakota aircraft. Consideration will be given to suitable candidates for immediate leading hand status. Canteen facilities.—Full details, in writing please, to the Manager: FIELD AIRCRAFT SERVICING DIVISION, Bovingdon Airport, Herts. [2276

HUNTING PERCIVAL AIRCRAFT, Ltd., urgently require qualified technical illustrators for work on A.M. publications. Good welfare facilities, including staff pension scheme.—Applications, in writing, to Personnel Manager, Hunting Percival Aircraft, Ltd., Luton Airport, Beds, stating age, experience and salary required. [0592

FIRST-CLASS senior stressmen required for South of England company. Must have sound engineering experience. New houses to rent available. Salary in the range of £800 to £1,000 p.a. in accordance with age and experience.—Please send full particulars, etc. to Box AC88922, Samson Clarks, 57-61 Mortimer Street, W.1. [0236

SEVERAL senior draughtsmen with experience of turbine engine installations required immediately for both fixed and rotating wing installations. Good welfare facilities including staff pension scheme.—Applications, in writing, to the Personnel Manager, Hunting Percival Aircraft, Ltd., The Airport, Luton, Beds, stating age, experience and salary required. [2223

OUTSTANDING opportunity for young woman with aviation and commercial experience to act as secretary/personal assistant to aviation manager. Offices in central London, lunch vouchers. Only applicants willing to accept large measure of responsibility and to work with energy should apply.—Send full particulars to Box 6383. [2285

SENIOR aircraft design draughtsman with experience of airframes or engine installations required by a London firm of design consultants to co-ordinate design projects with clients. Applicants should preferably be single or at least free to travel. This is a permanent position offering scope, and carries a generous salary for the right type of man.—Write to Box 6249. [2245

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0420

HANDLEY PAGE (READING), Ltd., The Aerodrome, Woodley, Reading, have vacancies in their design office for senior and intermediate draughtsmen, weightsmen and loftsmen. The work is on an interesting new project and there is scope for rapid advancement to suitable applicants.—Please send full particulars, etc. to the Personnel Officer. [0235

JOSEPH LUCAS (Gas Turbine Equipment), Ltd., have vacancies for graduates in mechanical engineering, physics and mathematics for appointments in the engineering and electronic research and development laboratory. These appointments are pensionable and offer good prospects to individuals with initiative and technical ability.—Applications, giving details of experience and qualifications, should be sent to Personnel Manager, Joseph Lucas (Gas Turbine Equipment), Ltd., Shaftmoor Lane, Hall Green, Birmingham. [2294

ASSOCIATED ILIFFE TECHNICAL BOOKS

INDUSTRIAL BRAZING

This book, by H. R. Brooker and E. V. Beatson, B.Sc.(Eng.), A.M.I.E.E., is the first full-length study of the subject and provides the answers to many problems. It covers in considerable detail all modern brazing methods, including torch, furnace, high-frequency induction, resistance, salt bath and dip, with chapters on the special techniques necessary for aluminium, stainless steels, beryllium copper, cemented carbides and vacuum tube construction.

Every student or engineer associated in any way with industrial brazing should have his own copy of this important book.

35s. net. By post 36s. 2d.

Obtainable from all booksellers or direct from:
ILIFFE & SONS LTD., DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

THE BRISTOL AEROPLANE COMPANY LIMITED

invites applicants for the post of

CHIEF INSPECTOR

in its Aircraft Division.

Suitable applicants will be aware of the high technical qualifications this post demands, but administrative ability of a high order is also essential.

A substantial salary together with Pension provision is offered.

Applications (which will be regarded as confidential) must give full particulars of career and experience, and should be addressed to the

Managing Director (Aircraft Division)
THE BRISTOL AEROPLANE CO. LTD.
Filton, Bristol

JUNIOR & SENIOR

TECHNICAL STAFF

REQUIRED

•

GOOD SALARIES & INTERESTING WORK

•

Please write:
CHIEF TECHNICIAN
Martin Baker Aircraft Co. Ltd.
Higher Denham, Uxbridge, Middx.
Phone: DENHAM 2214

SITUATIONS VACANT

ARMSTRONG SIDDELEY MOTORS, Coventry, have vacancies for a number of designers and senior and junior draughtsmen. Although gas turbine experience is most advantageous it is not necessarily essential as training will be given in this specialized work to suitably qualified draughtsmen.—Apply, in detail to Reference F.103, Personnel Manager, Armstrong Siddeley Motors, Coventry. [0200

TECHNICAL illustrator (senior) required, with considerable practical experience of illustrating for descriptive manuals, brochures, etc. Ability to produce first-class perspective and half-tone illustrations from workshop drawings. State experience, age and salary required.—Apply, in writing, to Personnel Manager, Flight Refuelling, Ltd., Tarrant Rushton Airfield, nr. Blandford, Dorset. [2232

THE ENGLISH ELECTRIC CO., Ltd., Strand Road, Preston, Lancs., require aircraft fitters. Applicants must have "on-site" repair and modification experience. Successful applicants will ultimately be based in various parts of the country after an initial training at the main works. Note: Works closed for annual holiday 17th to 31st July.—Applications should be made in writing to the Personnel Department. [2290

DEVELOPMENT engineer required to form research and development department of company engaged on work of national importance. British by birth. Education to at least H.N.C. standard essential. Some knowledge of explosives desirable but not as essential as broad outlook, initiative and enthusiasm.—Applications, stating full details of past experience and salary required, to the Managing Director. Box 6023. [2229

JIG and tool draughtsman urgently required for interesting development works on high-altitude aircraft accessories and other new projects in a rapidly-expanding organisation. Applicants should be of H.N.C. standard, some experience of high-speed rotary machinery would be desirable. Generous superannuation scheme, excellent prospects.—Reply, giving full details of experience, age and salary required, to Personnel Officer, Normalair, Ltd., Yeovil, Somerset. [2284

SENIOR stressman for important and interesting work in the civil and military spheres of aeronautical engineering, embracing turbines for aircraft air conditioning, accessory installations, turbo-props, small high-speed turbines and blowers. Applicants should be of degree standard with at least three years' experience in engine or allied fields. (Ref. 70.)—Write in detail or send postcard for Application Form, quoting reference number, to: Personnel Manager, de Havilland Propellers Limited, Hatfield, Herts. [2242

SITUATIONS VACANT

TECHNICAL authors. Vacancies exist in the technical publications department in connection with the preparation of aircraft technical manuals required for servicing, maintenance and repair of super priority aircraft. R.A.F. or R.N. maintenance experience may be an advantage.—Write, giving full details of experience and salary required, to Personnel Department, Vickers-Armstrongs, Ltd., Hursley Park, nr. Winchester. [2299

EXPERIENCED graduate mechanical engineer required to re-design for production precision oil hydraulic and light mechanical equipments for servo mechanisms. Previous experience in designing for production comparable equipment is essential. If not already familiar, applicants should be willing to study the theory, practice, and problems peculiar to closed-loop control systems.—Applications, in writing, to Personnel Manager, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17. [2243

RADIO officers are required to serve with British International Airlines, Limited, Kuwait, Persian Gulf (a subsidiary of B.O.A.C.). Essential qualifications include possession of current first-class Radio Telegraphy Operators licence and not less than 1,000 hours civil airline operating experience. Basic salary of £725 p.a., plus £200 p.a. single, or £250 p.a. married overseas allowance, plus Rs. 829 per month, free of Income Tax. Furnished single accommodation provided, for which a nominal charge is made. Married accommodation not at the moment available. Free medical service and insurance is arranged, and generous home leave is given with free passages to and from U.K.—Applications in writing to Staff Manager, Subsidiaries, B.O.A.C., Airways House, Great West Road, Brentford, Middlesex. [2272

PILOTS are required to serve with subsidiary companies of British Overseas Airways Corporation mainly in the Persian Gulf area. There is some urgency in the filling of these vacancies and applicants should therefore be reasonably available if selected. Essential qualifications are an A.L.T.P. licence for captains, and a Senior Commercial Pilot's licence with instrument rating for first officers. A Dakota aircraft endorsement is also necessary. The gross emoluments comprise a basic salary and an attractive scale of allowances and are free of income tax. Furnished accommodation is provided, but in certain areas married accommodation is not at the moment available. A nominal charge is made for the provision of accommodation. Free medical service and insurance is arranged, and generous home leave is given with free passages to and from U.K.—Applications in writing to Staff Manager, Subsidiaries, British Overseas Airways Corporation, Airways House, Great West Road, Brentford, Middlesex. [2271

SITUATIONS VACANT

ASSISTANT chief engineer required by company engaged in the design and development of guided weapons. Candidates must be mechanical engineers with first-class qualifications and experience in electronics and light engineering. Knowledge and experience in servo mechanisms essential since duties would include responsibility for missile control systems, electrical gyros, accelerometers, etc. Applicants should be 30-35 years of age and have sufficient personality and experience to administer and organize the development activity on these subjects.

WRITE, in detail, quoting reference "G," to Box AC91033, Samson Clarks, 57-61, Mortimer Street, London W.1. [0562

SITUATIONS WANTED

PILOT, age 31, 2,100 hours, A.L.T.P. licence. DC3, Viking. Home or abroad.—Box 6348. [2264

HELICOPTER pilot, age 29, nearly 400 hours rotary wing, 700 hours fixed wings, seeks position at home or abroad.—Box 6349. [2266

BOOKS, ETC.

"DEVELOPMENT of the Guided Missile," by Kenneth W. Gatland. Presents all the main information now available on the development of guided weapons in Britain, U.S.A., Germany, U.S.S.R., and elsewhere. Other chapters discuss guided missiles as instruments of research into the upper atmosphere and outer space, and as vehicles of inter-planetary travel. An appendix shows the characteristics of 90 powered missiles known to have been designed or constructed. 10s. 6d. net, from all booksellers. By post 10s. 11d., from Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E.1.

"ARCHITECTURE as a Career: A Practical Handbook for Students," by Maurice E. Taylor, M.T.P.I., A.R.I.B.A., F.I.L.A., F.R.I.A.S., F.S.A.Scot., R.I.B.A., Dist.T.P., A.A.Dip. of Planning. Discusses the various methods of approach to the architectural profession, gives information about the various R.I.B.A. exams, and offers the intending architect much sound advice on every aspect of planning his career. 10s. 6d. net from all booksellers. 10s. 11d. by post from Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E.1.

GLOSTER AIRCRAFT CO. LTD.
GLOUCESTER

HAVE VACANCIES ON SUPER-PRIORITY DESIGN AND DEVELOPMENT PROJECTS

FOR

AIRCRAFT DESIGN DRAUGHTSMEN
(SENIOR & JUNIOR)

Consideration will also be given to Draughtsmen with Mechanical, Structural or Electrical experience.

The conditions of employment are good with progressive salary, good sports and welfare facilities, pension scheme, etc.

APPLICATIONS STATING AGE, PREVIOUS EXPERIENCE AND EMPLOYERS SHOULD BE ADDRESSED TO THE
CHIEF DESIGNER

SILVER CITY AIRWAYS
LIMITED

HERMES FLEET

have the following immediate vacancies for employment at their Blackbushe Airport Maintenance Base:—

Airframe/Engine Fitters with recent experience on Hermes or similar Multi-Engined Aircraft.

Licensed Aircraft Engineers with current Multi-engined Aircraft, Engine Endorsements including Hercules 763/773 series.

Licensed Electrical Engineers.

Licensed Instrument Engineers.

Planning Engineers.

FREIGHTER FLEET

A limited number of vacancies exist for Licensed Engineers with Freighter/Hercules Endorsement for employment at Lympne/Blackbushe and Ferryfield Airports.

Airframe/Engine fitters with recent experience on modern aircraft.

Applications in writing, giving full details of qualifications and experience, to:

Personnel Officer,
FERRY AIRPORTS LTD.,
Blackbushe Airport, Camberley, Surrey.

WE HAVE COMPONENTS FLYING ON ALL THE WORLD'S AIRCRAFT

A.R.B. and A.I.D. approved electrical and ancillary components for immediate delivery.

P.W. Greenwood LTD
(WILLESDEN)
62 SHIRLAND ROAD · LONDON W.9

Invaluable to all who manufacture, use or deal in non-ferrous metals

METAL INDUSTRY

HANDBOOK AND DIRECTORY, 1954

ONE VOLUME — covering every aspect of the industry

Now in its 43rd year of publication, METAL INDUSTRY HANDBOOK provides a mass of data and information on all non-ferrous metals and processes. Its Buyer's Directory lists a wide range of producers, stockists and factors of all basic metal products, metal-working machinery and tools, and metal finishing equipment. METAL INDUSTRY HANDBOOK is an invaluable reference book for all who manufacture, use or deal in these metals.

Ready this month

Supplies are limited. 21s. net. By Post 21s. 8d.

From booksellers or direct from:—

PUBLISHING DEPT., DORSET HOUSE, STAMFORD ST., LONDON, S.E.1

AMAL

Component Specialists to the Aircraft Industry

SBAC

Components made to manufacturer's specification

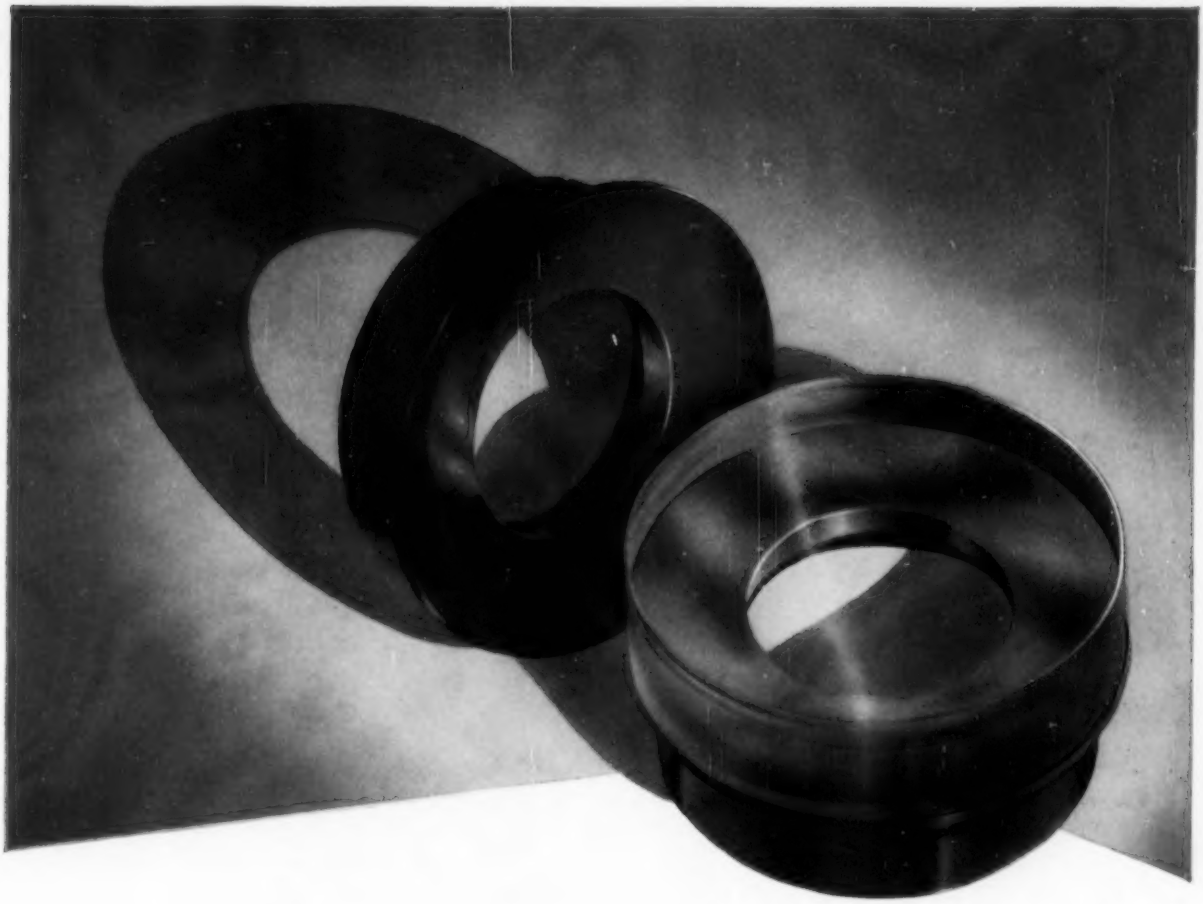
A.134

Amal Ltd., Holdford Rd., Witton, Birmingham 6

INDEX TO ADVERTISERS

	Page
Air Trainers, Ltd.	10
Alvis, Ltd.	19
Amal, Ltd.	36
Armstrong Whitworth Aircraft, Ltd., Sir W. G.	12
Aviation Traders, Ltd.	6
Birkett and Sons, Ltd., T. M.	8
Blackburn and General Aircraft, Ltd.	5
Boulton Paul Aircraft, Ltd.	Cover i
Bristol Aeroplane Co., Ltd., The	34, Cover iv
Brown and Co., Ltd., E. G.	27
Burgess Products, Co., Ltd.	29
Burnley Aircraft Products, Ltd.	6
Canadair, Ltd.	15
Cellon, Ltd.	14
Chain Belt, Co.,	29
Cross Manufacturing Co. (1938), Ltd.	32, 34
De Havilland Aircraft Co., Ltd., The	18
Dowty Equipment, Ltd.	34
Dunlop Rubber Co., Ltd.	22, 23, 34
Electro-Hydraulics, Ltd.	2
Fairey Aviation Co., Ltd., The	17
Ferry Airports, Ltd.	35
Firth and John Brown, Ltd., Thos.	16
Flight Refuelling, Ltd.	24
General Electric Co., Ltd., The	8
G.Q. Parachute Co., Ltd., The	4
Gloster Aircraft Co., Ltd.	35
Greenwood (Willesden), Ltd., P. W.	36
Headquarter and General Supplies, Ltd.	31
Helliwells, Ltd.	28
Hobson, Ltd., H. M.	Cover ii
Hunting Percival Aircraft, Ltd.	20
Iliffe and Sons, Ltd.	28, 34, 36
Integral, Ltd.	10
Jenks Brothers, Ltd.	28
Lewis, Ltd., D.	32
L. K. Regent, Ltd.	30
Lucas (Gas Turbine Equipment), Ltd., Joseph	Cover iii
Martin Baker Aircraft Co., Ltd.	34
Muir and Adie, Ltd.	32
Opperman, Ltd., S. E.	26
Power Jacks, Ltd.	9
Proops Brothers, Ltd.	30
Reed, Ltd., Austin	24
Robinson and Co. (Gillingham), Ltd., L.	26
Roe and Co., Ltd., A. V.	33
Rollason, Ltd., W. A.	30
Rotol, Ltd.	13
Rozalex, Ltd.	31
Sangamo Weston, Ltd.	27
Shackleton, Ltd., W. S.	1
Short Brothers and Harland, Ltd.	3
Simmonds Aerocessories, Ltd.	7
Smiths Aircraft Instruments, Ltd.	21
Standard Telephones and Cables Ltd.	25
Staravia	32
Teddington Controls, Ltd.	29
Vickers-Armstrongs, Ltd.	32
Westland Aircraft, Ltd.	11
Wilson and Sons (London), Ltd., W.	26
Wolverhampton Aviation, Ltd.	30

Printed in Great Britain for the Publishers, ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1, by SUN PRINTERS LTD., London, and Watford, Herts. *Flight* can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service, Ltd.; Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd.; Wm. Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co. Entered as Second Class Matter at the New York, U.S.A., Post Office.



The optical maker's art is applied in producing camplates of super finish and accuracy for 2,000 p.s.i. fuel pumps. Three basic pumps cover present engine requirements with deliveries of 460 to 2,800 gallons per hour.

FUEL AND COMBUSTION SYSTEMS FOR GAS TURBINE ENGINES

LUCAS

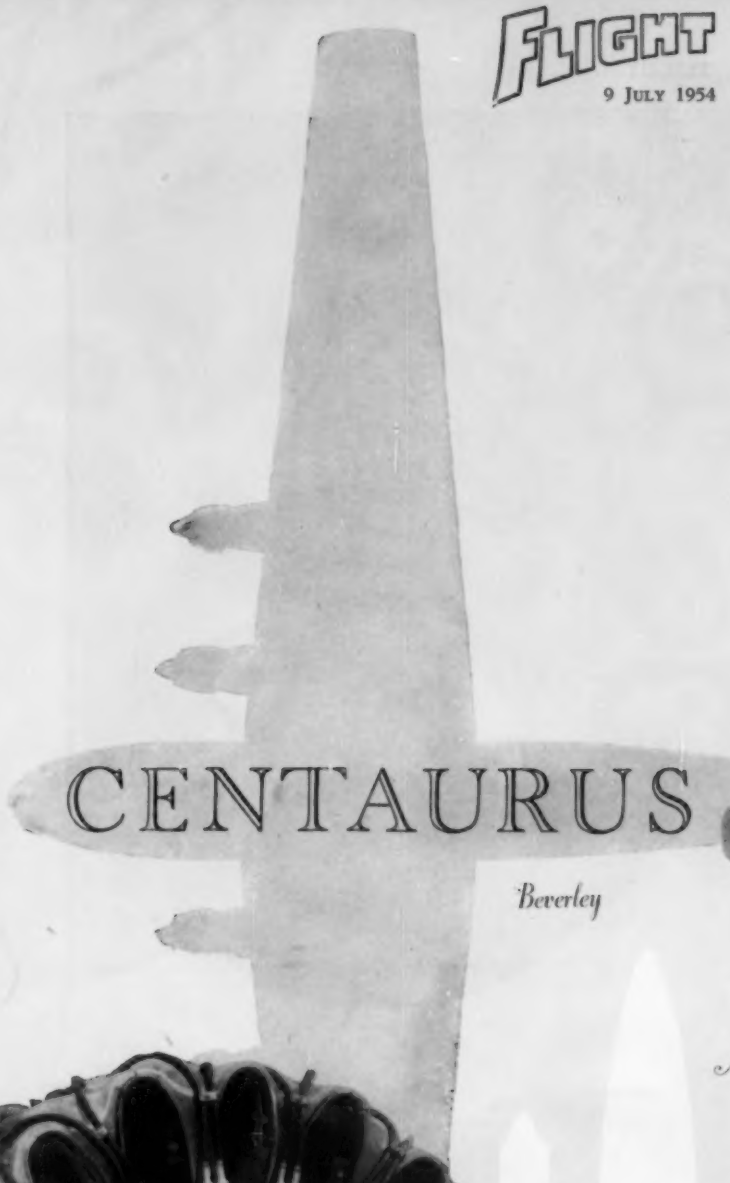
JOSEPH LUCAS (GAS TURBINE EQUIPMENT) LTD., BIRMINGHAM & BURNLEY

Lucas-Rotax (Australia) Pty. Ltd., Nepean Highway, Cheltenham S22, Victoria, Australia.
Lucas-Rotax Ltd., Scarborough, Ontario, Canada.

FLIGHT
9 JULY 1954

Sleeve-valve reliability in a Turbine age

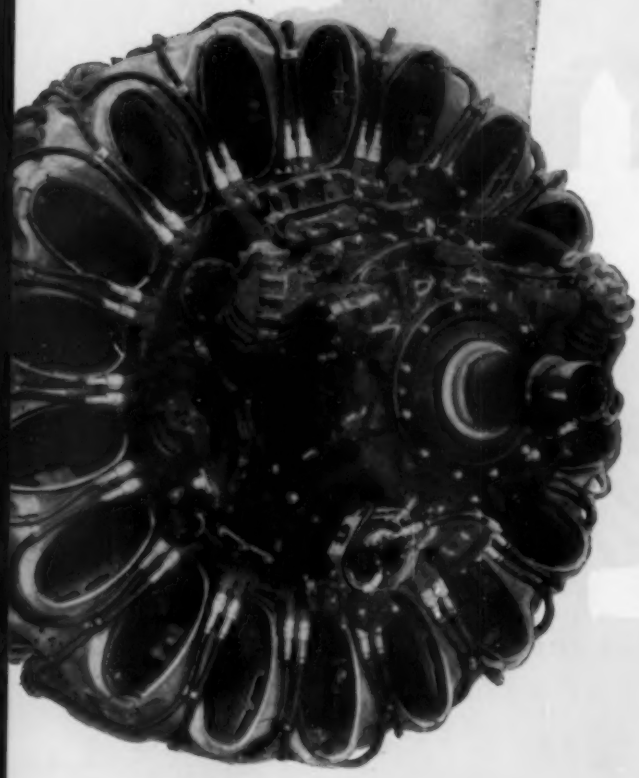
CENTAURUS



Beverley

Sea Fury

Ambassador



In Sea Furies over Korea, in Ambassadors flying B.E.A. routes to the Continent, and now in the R.A.F.'s huge new Beverley transport, "Bristol" Centaurus sleeve-valve engines have given and are giving constant proof of their reliability, efficiency and economy. Such qualities will ensure the Centaurus many years of useful application and service.

THE *Bristol* AEROPLANE COMPANY LIMITED · ENGLAND